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ACORN USER

JUNE 1985

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SAVE ON THE MOVIT ROBOTS: PAGE 11

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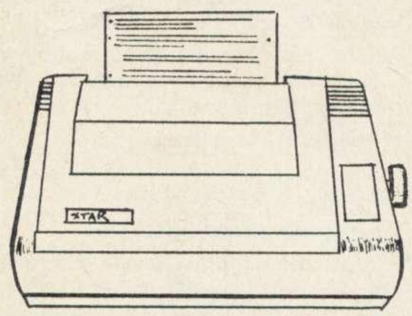
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CONTENTS

FEATURES

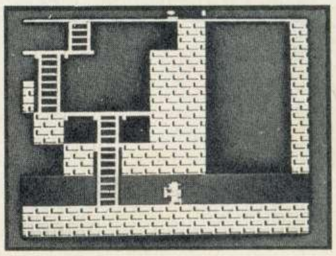
NEW USERS

ATOM

YELLOW PAGES

The major listings for this issue are printed in the yellow section starting on page 97. These are also available on cassette (which includes a tape-to-disc transfer routine and index program) and in bar code format to save you typing them in. Details of how to order these on pages 96 and 110

REVIEWS



REGULARS

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Acorn User back Sideways RAM page 7

10% off the Movits – page 11

CONTENTS

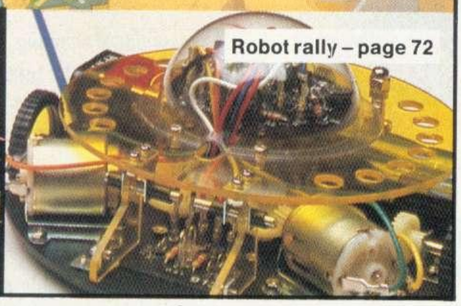
ROBOTICS SPECIAL JUNE



Secrets of Castle Quest – page 164



Music 500 review – page 172



Robot rally – page 72

ROBOTICS

COMPETITION

BUSINESS

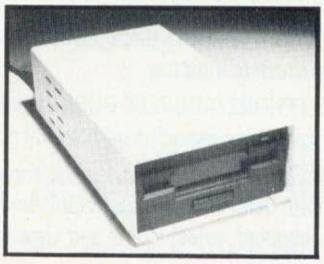


Acorn User
June 1985
Issue number 35

Cover photography
by Barbara Bellingham

NEXT MONTH

DISC SPECIAL



Our special feature next month includes a listing of disc drives, a round-up of disc systems, a comparative review of six DFSs, disc utilities and disc menu programs

Sideways RAM utilities

Richard Harris continues his three-part series

Languages: Pascal

Your guide to this highly structured language is Simon Williams

Wordwise Plus reviewed

Computer Concepts' new wordprocessor under scrutiny

Write your own adventures

Joe Telford gives the game away

Musical MIDI round-up

Notes for authors

Acorn User welcomes submissions from readers. Articles should be typed, double-spaced text with diagrams and screen dumps on separate sheets, or on disc in *Wordwise* (saved as a *SPOOL file using option 8) or *View* format. Leave large margins to allow space for editing.
Please enclose all programs on disc or cassette, with listings if possible. Also follow the style used in presenting listings in the yellow pages section. Photos should be 35mm, or larger, transparencies, or 5in by 7in black and white prints. Ensure your name is on everything, and keep a copy. Enclose a suitable stamped, addressed envelope if the submission is to be returned. Attach a short letter with the article giving its title with a daytime phone number if possible. Address your article to the Technical editor. Articles are acknowledged on receipt, but not submissions for the regular columns, letters pages and competitions. Please limit telephone enquiries to the Technical editor to Wednesday and Thursday afternoons.

ABC

AMX MOUSE

Catch an incredible AMX MOUSE! The advanced opto-mechanical device that brings to your BBC micro facilities once only available on more expensive computers. Now you can use ICONS, WINDOWS AND POINTERS in your own programs.

AMX PACKAGE

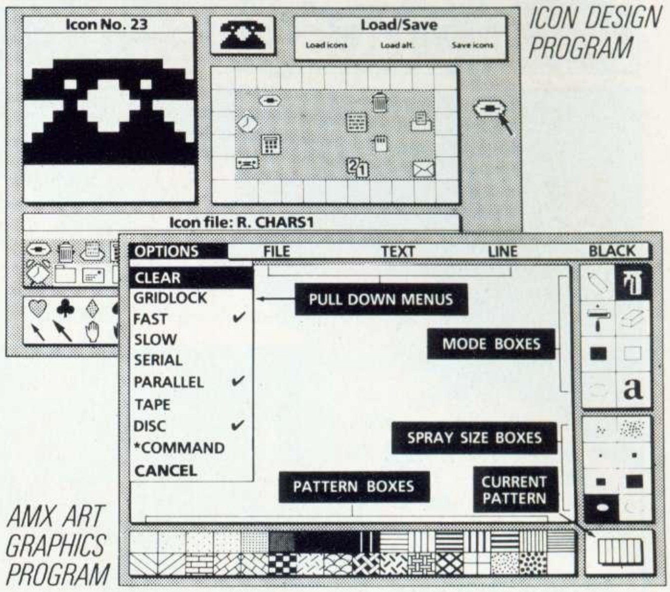
Plug the MOUSE into the user port, and the EPROM into your board. The latter contains fast machine code routines for creating on-screen windows, icons and pointers. And means that the MOUSE buttons can be progammed for use with commercial software such as Wordwise and View. There are two manuals included, explaining how to operate the MOUSE and the ROM routines, which are available in both basic and machine code programs.

Included in the package are two superb programs:

AMX ART has to be seen to be believed! It's a computer-aided drawing program that's just as good for serious applications–such as the preparation of detailed architectural and engineering drawings or teachers' worksheets–as it is for having lots of family fun! And if you're artistically inclined, you'll be astonished at the quality of work you can produce and save. It makes full use of on-screen menus, pull-down menus and icons: the ideal, easy way for novices to learn and gain in confidence.

ICON DESIGNER is an invaluable program for creating and storing icons for use in your OWN programs.

The AMX MOUSE may be used with any BBC Model B fitted with the Operating System 1.2; and it's compatible with the 6502 second processor and disc or tape filing systems.



ICON DESIGN PROGRAM

AMX ART GRAPHICS PROGRAM

New! AMX DESK

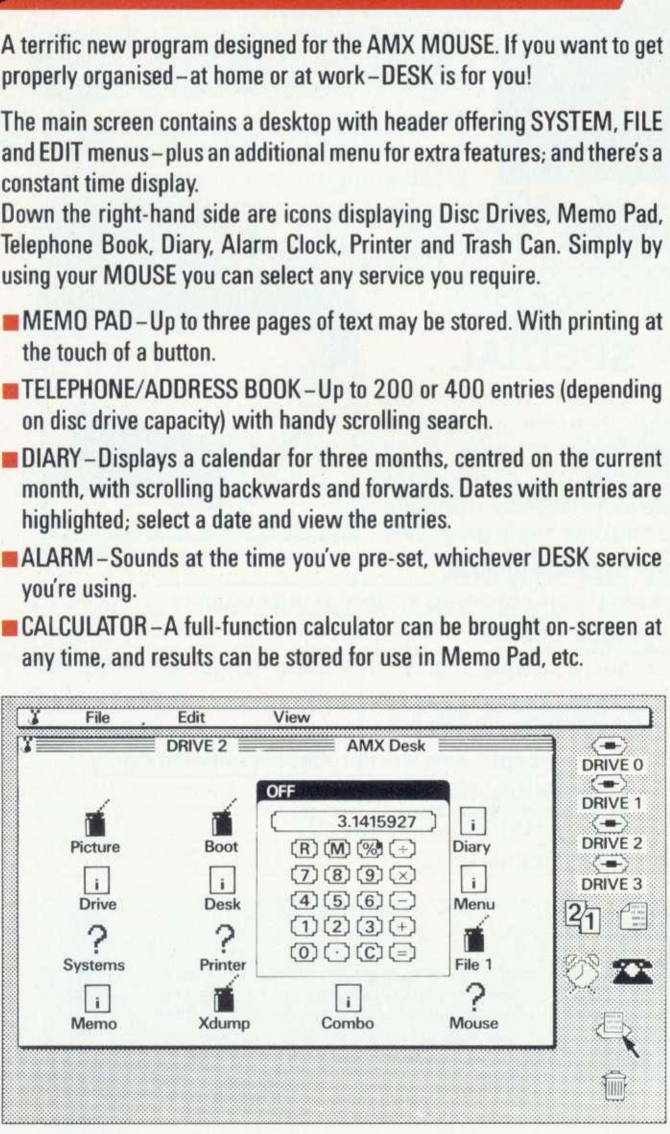
DISC ONLY £24.95 INC VAT

A terrific new program designed for the AMX MOUSE. If you want to get properly organised–at home or at work–DESK is for you!

The main screen contains a desktop with header offering SYSTEM, FILE and EDIT menus–plus an additional menu for extra features; and there's a constant time display.

Down the right-hand side are icons displaying Disc Drives, Memo Pad, Telephone Book, Diary, Alarm Clock, Printer and Trash Can. Simply by using your MOUSE you can select any service you require.

- MEMO PAD–Up to three pages of text may be stored. With printing at the touch of a button.
- TELEPHONE/ADDRESS BOOK–Up to 200 or 400 entries (depending on disc drive capacity) with handy scrolling search.
- DIARY–Displays a calendar for three months, centred on the current month, with scrolling backwards and forwards. Dates with entries are highlighted; select a date and view the entries.
- ALARM–Sounds at the time you've pre-set, whichever DESK service you're using.
- CALCULATOR–A full-function calculator can be brought on-screen at any time, and results can be stored for use in Memo Pad, etc.



See us on **Mouse Links** on Viewfax tube link on Prestel: **Page No. *258216#**

Any window showing Telephone/Address Book, Diary or Memo Pad may be dumped to the printer by simply selecting the printer icon.

An interface program for Wordwise + and View means pictures created with AMX ART can be merged with text upon printing out.

New! AMX UTILITIES

DISC ONLY £14.95 INC VAT

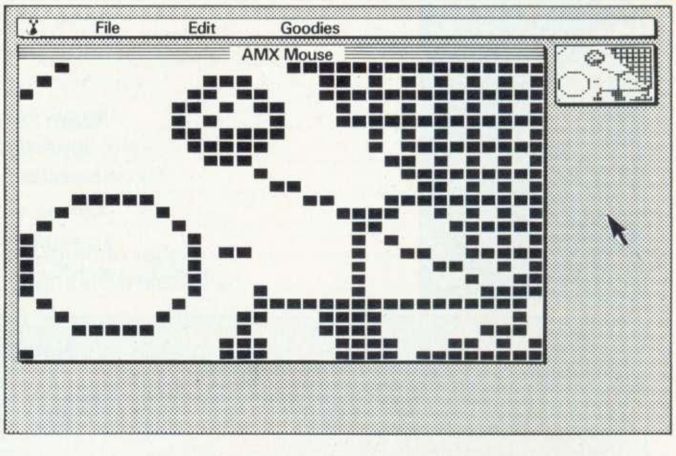
Another remarkable new program for the AMX MOUSE. Now you can enjoy many drawing features you'd never expect to find at this price!

The Zoom facility means easy and accurate amendments to your drawings: one dot becomes a character. You can copy, rotate and reflect; enhance circles; draw ellipses and arcs; and print icons, too. Borders can be added, and pictures can be stripped and centred ready for saving and printing.

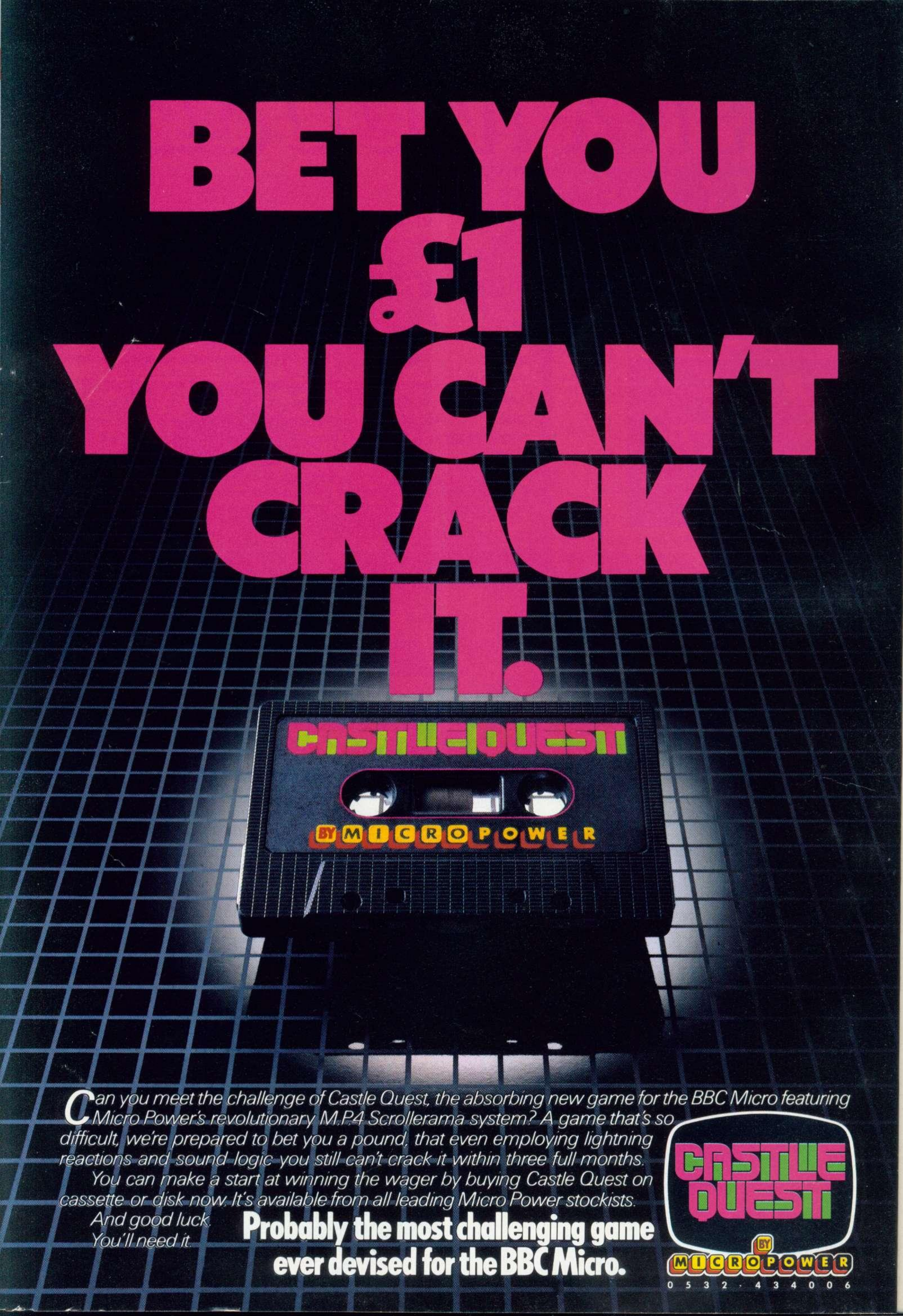
There's colour sketch, too...

Great for budding artists!

All disc software is available on 40 or 80 Track and 3" disc. Please state which you require when ordering.



These exciting AMX products are available from top computer dealers. Or you can order direct from us. Send cheque/PO to Advanced Memory Systems Ltd, Green Lane, Appleton, Warrington WA4 5NG. Ring (0925) 62907)602690 for instant ACCESS and VISA orders.


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BBC B+ revealed

by Bruce Smith

THE BBC B+, first described in the March issue of *Acorn User*, was due to have been launched last week at £499 with disc interface and 64k of memory as standard.

The B+ is not seen by Acorn as a new micro, but as a development of the BBC system – and the company has left room for a model C.

Acornsoft will be releasing some software to exploit the new features 'by Christmas', but other companies we contacted were unaware of the B+.

Compatibility was an overriding consideration in developing the machine, but there are several major changes. First, RAM is increased to 64k, giving about 26k free for programs no matter what screen mode is used.

Second, a disc interface is fitted as standard using the new 1770 controller chip. The filing system has been expanded, but is essentially the same as the old one.

Finally, the number of sideways ROM sockets has been increased to six, with four free for the user.

Externally there is no difference from the model B. It is only when you take the lid off that it is revealed as something different.

The most noticeable feature inside is that the sideways ROM sockets are located at the top-left hand corner of the board in two banks of three. The 64k of RAM sits to the right of the machine while the main microprocessor chips sit in a neat row along the front under the keyboard.

A new processor, the 6512, sits at the heart of the B+, but this is fully software compatible with the faithful 6502. The only slight difference between the two chips is in the clock-drive circuitry – which improves performance with the second processor.

As already mentioned, the 32k of RAM is used in two blocks. The first 20k handles the shadow screen memory, in a similar way to the Aries B20 board. This allows about 26k for programs in any mode.

The shadow RAM is selected with the command *SHADOW after which any subsequent mode change will select the shadow RAM. *SHADOW 1 will reset the user RAM as selectable for screen RAM (as is normal on current B models), this is also the default state thus ensuring software compatibility.

The shadow screen memory may also be specified by selecting a mode value in the range 128 to 135. Thus MODE 128 is the equivalent of:

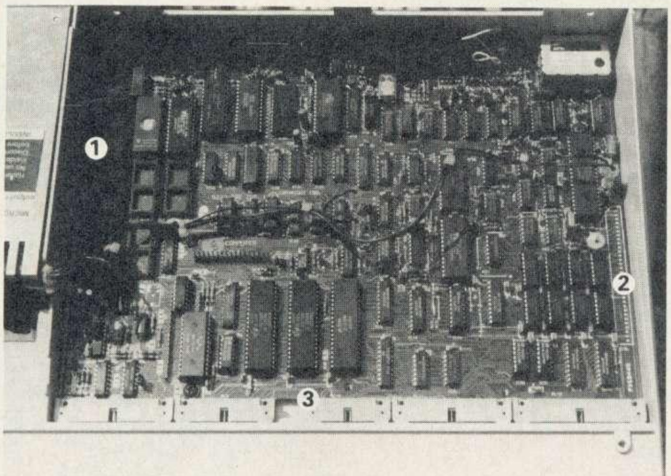
```
*SHADOW
MODE 0
```

The 20k shadow RAM may also be used for data storage but not programs. Acorn will not actively support this use of the shadow RAM, but no doubt some games houses will find a use for it.

The remaining 12k of RAM is mapped into the sideways RAM area from &8000 to &AFFF and is free for user applications and service ROM software under 12k in length. However, it will not support language ROM software, even if it will fit into 12k.

The six sideways ROM sockets are mapped as two 16k images, giving a single ROM space of 32k. Basic II and

page 11 ▶



A new board – issue 1 inside a standard BBC case – is where the B+ changes can be seen.

1 Top left, six sideways ROM sockets (two rows of three). Two occupied by combined Basic/OS and DFS 2.1. Two other sockets for voice synthesis.

2 Bottom right, eight RAM chips giving 64k.

3 Middle front, 6512 processor, 1770 disc controller and user VIA.

Acorn User backs easy-fit sideways RAM

A SUPER new easy to fit sideways RAM for the BBC micro is being backed by *Acorn User*. Developed by Hybrid Memory Products, the 'UserRAM' provides 16k of RAM and simply plugs into a sideways ROM socket.

The only connection to make is to hook a special fly-lead around the leg of chip – there is no need even to take it out.

***Acorn User* will be offering continuing software support.**

The cost is just £45.50 inclusive of VAT and post. A bumper pack is also available at £62 which includes a complete suite of software plus a copy of *The ROM Book* by Bruce Smith.

Cheques and POs should be made payable to 'Hybrid Memory Products' and sent to UserRAM, Acorn User, 68 Long Acre, London WC2E 9HJ. Full details next month!

TTNS set to expand at home and overseas

by Geoff Nairn

NEWS International, owner of *The Times*, looks set to expand its electronic publishing ventures. Following the Times Network for Schools (TTNS), which is aimed at secondary schools, the company plans to extend the service to primary schools and colleges.

One application being looked at for colleges of further education, and polytechnics is 'distance learning', where part-time students can send in assessments and communicate with tutors using a BBC micro connected to the network.

TTNS has just switched over to a dedicated computer, a Prime 850 (previously it had to share a British Telecom computer), but TTNS still uses BT's Telecom Gold. If expansion plans go through, Times Network Systems could well be in the market for a more sophisticated electronic mail database.

According to Gordon Jones, who heads the Times Network Systems, plans for the new services are only at the 'embryonic stage' but he's expecting a decision possibly at the end of the summer.

Plans to move into non-educational markets were more distant. Jones said: 'We're obviously looking at several possibilities, such as value-added networks and business services but they're 3-4 years off.'

TTNS is setting up international links with France, Germany and Australia so schoolchildren can improve their language skills by talking with foreign schools.

Education news – page 141



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All in all, we're expecting over 120 different companies to be there, as well as Acorn themselves.

And because the Exhibition is at the Barbican there's plenty of restaurants bars and rest areas.

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P.S. Acorn have promised some very special events exclusive to the show!

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AU2

Royal music

THE Royal School of Music is looking into ways of using a BBC micro for teaching. The research, carried out at the University of Lancaster, centres on a specially-developed music keyboard which links up to the BBC micro.

Notes played on the keyboard can be entered into the computer's memory and manipulated in a variety of ways. Eventually the aim is to produce teaching packages to be used with the keyboard.

Hairy software

HAIR Defenders must be the strangest game ever received at our office. It's a revision quiz aimed at City and Guilds hairdressing students who have to use zap down helicopters by answering questions about hairdressing.

Subjects covered include wigmaking, hygiene, hairdressing science, and ladies and gents styles. The disc costs £15.

The self-explanatory *Hair Conditioners* program, for the Beeb or Electron, costs £6 (£8 on BBC disc). Promised soon is *Kitchen Raiders*, for catering students.

Contact John Lyons on (0276) 65275.

Fix for micros

MICROFIX is a repair centre specialising in the repair of BBC micros, Microvitec monitors and peripherals. The centre is offering a year's maintenance contract for £30. Phone 01-968 9214.

Video link

SCHOOLS can link up their BBC micros to VHS video recorders thanks to a piece of hardware called Felix Link. This allows computer-generated text and graphics to be displayed over video pictures. Contact Felix Learning Systems on 01-404 5041.

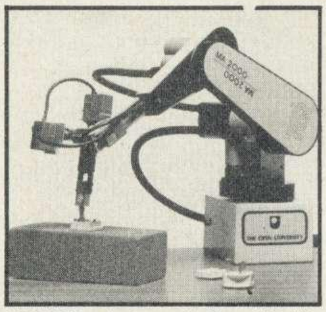
Help on open day

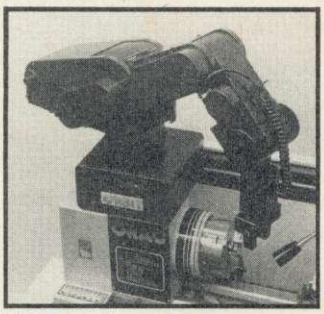
BEEB and Electron owners in the Essex area can attend an open clinic on Sunday, June 2 at Witham community centre. The clinic is being held by Namebug, and is aimed at people who might want occasional help but don't want to join a club. Details from Dave Watts on (0245) 358127 or Andy Purkiss on (0376) 515609.

'Slimmer' industry robot from OU

TECQUIPMENT has brought out an educational robot to work with the BBC micro. The MA2000 robot arm will set you back £3,500 and was designed to meet the Open University's need for a 'slimmed down' version of an industrial robot. Details on (0602) 722611.

More expensive is the Orbit robot from Denford Machine Tools at £6,325. Again, it is designed to be used with a BBC micro and is aimed very much at the training market.





MA2000 robot arm (left) and Orbit and Oric (right) in action.

Denford also makes a CNC bench-top trainer, Orac, which costs £5,675. This can be programmed from a Beeb and there's also CAD/CAM software. Denford Machine Tools, Brighouse, West Yorkshire HD6 1NB.

Reuters deal worth £1m

REUTERS, the international news agency, has signed a £1 million contract with Acorn to upgrade its financial information system, Monitor.

Reuters Monitor offers high-value financial information to over 40,000 subscribers worldwide, but can only be accessed by dedicated 'dumb' Reuters terminals. Acorn's business division is to make an add-on for these terminals, adding graphics, memory and processing power.

This will enable subscribers to manipulate and store financial data, rather than just display single pages. Typical applications include, analysing historical data, plotting trends and calculating moving averages.

Acorn has supplied 1,300 development versions of the add-on and has received an order for another 1,000, which will be built on a standard plug-in card. Empty slots in the card allow Reuters to add its own custom software ROMs depending on the user's requirements.

The Reuters deal signifies a change in policy for Acorn's business division: it will no longer sell products bearing the Acorn name. Rather, it is looking to supply other manufacturers with custom-designed hardware, which they can then sell under their own badge.

Acorn's scientific and technical group is looking for similar OEM (Original Equipment Manufacturer) deals on its range of ABC machines. Only the ABC200 will be sold through dealers as an Acorn machine, and Acorn has started delivery of trial units to universities.

Business news – page 127

Torchnet tackles teeth

LONDON's Dental School has installed a network of Torch micros for students, which is claimed to be the first of its kind in Europe.

It allows students to compile patient lists for the day, tap into a database of dental information and leave messages.

The system uses the Torchnet local area network to link 47 terminals on several floors to four hard disc file servers.

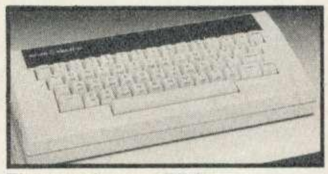
Students can allocate their time more efficiently and, according to Stuart Morganstein, director of the school: 'It brings us nearer the time when we can match the right student with the right patient.'

Patients, for their part, seem quite happy, if only because it cuts down on time spent in the dreaded waiting room!

Electron sales beat BBC

SALES of the Electron overtook those of the BBC micro over Christmas, according to a recent survey.

During the three months leading up to Christmas, the Electron took 15 per cent of the home computer market with 94,000 sales, while the BBC micro took just seven per cent.



Electron: betters BBC

Overall, Acorn took nearly a quarter of the market sales during the Christmas period against last year's eight per cent share.

The survey, by Audits of Great Britain, further revealed that Commodore's share had remained static during 1984 while Sinclair's dropped.

Index from disc

HAVING trouble tracking down that elusive article? Then let McHugh Enterprises come to your rescue. The company offers a disc database of over 1,000 references for the 22 editions of *Acorn User* up to May 1984.

Also, there's a more general magazine bibliography which contains over 7,800 references from magazines that feature the Beeb.

Prices start at £10 per disc. McHugh Enterprises, 43 Hookstone Oval, Harrogate, North Yorkshire HG2 8QE.

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Telephone: 06845 68421

* Subject to availability.



View from the cockpit with Johnny Turbo in the lead

'Revs' follows 'Aviator' lead

REVS, from the author of *Aviator*, is claimed to be the most realistic motor racing simulation for the Beeb.

Silverstone

Acornsoft's latest game is modelled on Silverstone, with the track's curves, dips and hills accurately reproduced. The handling of the car – a Formula 3 Ralt RT3 – is meant to be identical to the real thing. It even has adjustable 'wings' to change the 'ground effect', which helps the car keep grip around corners.

The game was written by Geoff Crummond, in collaboration with driver David Hunt, who was sponsored by Acorn last year.

Prices are £14.95 for the cassette, or £17.65 on disc.

B+ revealed

▶ *from page 7*

OS1.2 are combined into a single ROM to provide OSBASIC and is situated in socket 15 (which is mapped as 14 and 15!) – though altering a simple link setting allows it to be mapped as socket 0/1.

The DFS, version 2.1, sits in any socket, leaving four empty. The DFS includes several new commands such as *FORM(at) and *VERIFY, both rather embarrassing exclusions from the original DFS firmware – although users are still stuck with 31 files per disc surface.

Other new commands include *FREE and *ROMS which will supply details of status and ROMs present within the micro.

The DFS is 8271-compatible but some problems might occur due to protection on discs. Acorn admits that problems do exist for early dual format 40/80 discs, but stresses there will be an exchange service for Acornsoft products. No problems have been encountered with standard 40-track, disc based software.

The ROM sockets will accept 8k, 16k or 32k chips, though this must be hardware selected via a bank of links.

The sideways RAM memory may be 'overlaid' into any ROM socket. Once the socket has been selected the top 4k of the 16k bank into which the sideways RAM is mapped, ie memory from &B000 to &BFFF is also available. Thus it is possible to have 4k of firmware controlling its own sideways RAM!

Several new OS routines are supplied to provide a machine code interface to the new hardware. Most notable of these are OSWRSC (OS Write Screen) and OSRDSC (OS Read Screen) to give access to the shadow RAM.

At £499 the B+ may seem expensive, but in the long run it certainly works out a lot cheaper than expanding a model B (even at discount prices) with screen RAM plus sideways ROM and RAM. Future developments for the B+ will probably include the addition of the ADFS (advanced disc filing system) which will allow the 1770 disc controller to be used to its full double density capabilities.

More details of the BBC B+ in next month's *Acorn User*.

Before you go mad at Silverstone, let David Hunt drive you round the bends.



REVS is far and away the most realistic simulation of motor racing ever devised.

Technically, of course, it's a computer game for the BBC Micro. But somewhere in the middle of your first practice lap you'll realise that 'game' has nothing to do with it.

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So take our advice: before you try for the lap record at Silverstone, study David Hunt's circuit diagram.

After all, when was the last time you had a free driving lesson from a professional?

For the address of your nearest Acornsoft stockist, or to order REVS on credit card, call 0933 79300 during office hours.

Or send the coupon below to: Acornsoft, c/o Vector Marketing, London Road, Wellingborough, Northants NN8 2RL. Please allow 28 days for delivery.

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Last year's Acorn User Show was a massive success, so make sure of your place in July

B+ to star in Show

THIS year's Acorn User Show looks set to break all attendance records with the new BBC B+ and plenty of software set for launch.

To prove the point, it moves to a larger venue, the Barbican Centre in the City of London. The exhibition is spread over four days, July 25-28, and is split into four main sections: home, business, education and communications, offering something for everyone.

THE THIRD OFFICIAL ACORN USER EXHIBITION

Acorn relaunch

Over 100 exhibitors will be displaying their wares and 40,000 people are expected to pass through the doors. Acorn will be using the Show to relaunch itself to the public and the industry after the traumas of recent months.

Leading the headlines will be the BBC B+, with 64k of memory disc interface as standard (see page 7).

Elite 2, the 6502 second processor version of the best-selling *Elite* space game, will be unveiled and you can try your hand at *Revs*, Acornsoft's realistic simulation of the Silverstone race track.

Users' clinic

Your very own *Acorn User*, as host to the show, will be there in force. There will be a users' clinic, where baffled readers can put their queries direct to authors, with back issues, and similar highly collectable items on sale.

Tickets cost £3, or £2 for under 16s. Trade enquiries and multiple ticket orders on 01-930 1612.

Hologram hope to beat pirates

A & F Software claims to be the first software house using holograms in its latest bid to stamp out software piracy. Each copy of its *Chuckie Egg 2* game carries a hologram, which is virtually impossible to copy and costs just a few pence, so it won't increase significantly the price of the software.

Said A & F's Doug Anderson: 'I've seen commercially pirated copies of our tapes returned under guarantee to us. The hologram stickers mean that now the Trading Standards Officer can instantly identify them.'

Micros take to the tree tops

BBC micros turn up in the strangest of places. Scientists with Operation Raleigh are taking battery-powered Beebs to the tree tops in the Costa Rican jungle, to collect data about the flora and fauna.

Meanwhile, back on the base ship *Sir Walter Raleigh*, BBC micros are used to log-on to the MIMAC maritime database via a satellite link to the UK. This contains navigational information, weather forecasts and maritime regulations.

Two hundred youngsters have taken part in the first phase of Raleigh, which has so far taken them to the Caribbean. The ship then sails on to Central America.

Heather Williams, a marine biologist, is involved with a variety of projects which use BBC micros – mainly for data logging. Currently she is on the island of Roatan, near Honduras, investigating swamplands, tagging turtles, collecting sponges and shells.

Schoolchildren in the UK can ask Heather Williams about her work, using the Times Network – the electronic mail system for schools – which has a satellite link to the *Sir Walter Raleigh*.

The Times Network has also sent out its own correspondent, 24-year-old Lakh Singh, and he will be sending back regular reports.

THE MAN FROM U.N.C.L.E.

Our regular columnist has a communications problem . . .

PUSH back the frontiers of knowledge. Be at the cutting edge of new technology. Yeh, right on, get yourself a modem, I thought.

Put an end to all that whistling down the 'phone when you want to send copy into *Acorn User* (it doesn't half make your mouth dry and your lips take ages to unpucker).

So I did. I ordered one, got myself some flex, bought a phone extension socket, installed it and waited.

It arrived, something of a cross between a DIY kit and a jigsaw puzzle. The Post Office wildebeest formation tap dancing team had done their thing all over it – crushed something rotten. Retaliation on a massive scale for messing with the phone socket (I know the PO and BT are separate these days, but old loyalties die hard).

So, it's back to the budgie impressions. I should have known better than to tangle with the big boys.

One thing I'll be missing are the 'celebrity' interviews being done by Micronet. They take their gear to the homes of people so famous that you've never heard of them, and let you ask questions like 'who are you?' At this rate they'll be interviewing Bruce Smith in a year's time.

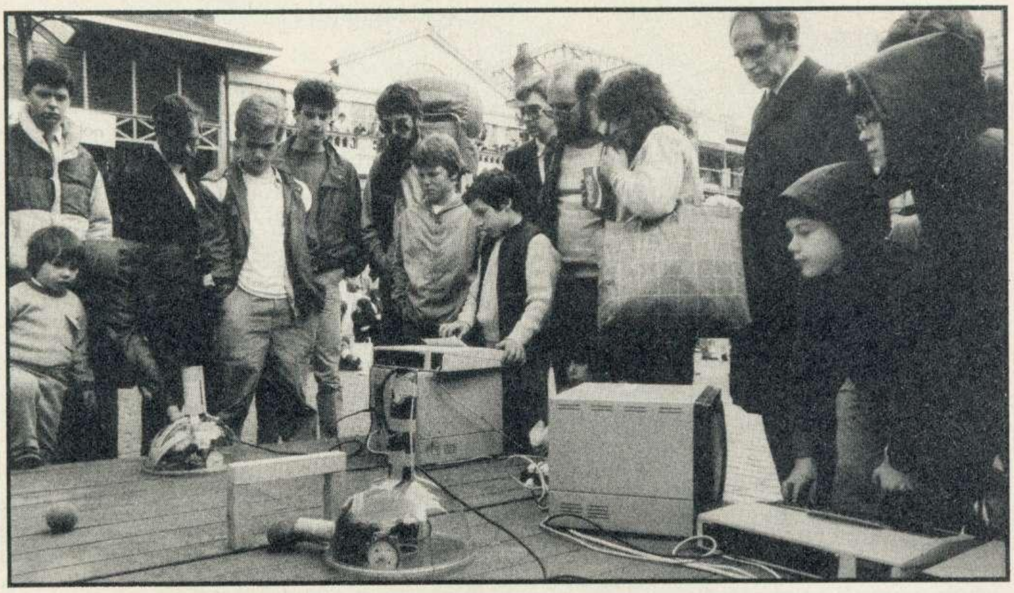
Anyway, the new breakthrough seems to be wrist terminals. Seiko have got one for about £120. Just plug it into your Beeb and fill up its memory with useful things.

It's going to cause havoc down the four ale bar of the Bewildered Pig. Where once the regulars had spaniels and salukis attached to their wrists, now they'll be towing assorted micros around and asking each other if they know it's closing time in Djibouti.

'Oi pal, you just put your foot right on my Apricot.'

'This Acorn's giving me some gyp. It keeps telling me that Ramadan's coming up and I shouldn't be on licensed premises.'

Ah, the wonders of man's ingenuity.



LONDON's Festival of Computing got off to a great start with robots and children mingling together in Covent Garden's sunny Piazza. The first day concentrated on personal robotics and featured, amongst others, the Zero 2 and the Beasty arm.

Highlight of the week was the Logo Spectacular, the first of its kind according to the organisers, Inter-Action. Many unsuspecting tourists who wandered into the exhibition tent were confronted by a large, furry turtle being 'expertly driven' by schoolchildren. Others, like the youngsters above, played 'turtle football'.

Several varieties of Logo and turtle were on display, such as a single-keystroke Logo which disabled children from the Aylesbury Day Centre found particularly 'user-friendly'.

Inter-Action is keen to set up more Logo shows and community-based computer activities. The group can be contacted on 01-511 0413.

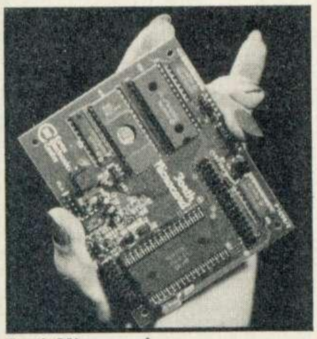
'No conflict' with monitor for Atom

ATOM users should look out for three new products from Bear Hardware.

First off, a machine code debug monitor program on disc or in EPROM. It will run hardware real time and there are claimed to be no command name conflicts with the Atom assembler. Price should be about £50.

Two hardware items next: a backplane interface and a RS232 card. Both cost £10.35 but you've got to add the components yourself. The Bear disc controller should be out soon for about £100.

The latest Atom catalogue is available; just send a second class stamp to cover 100g weight. Details on 01-897 3059.



Forth Microcard

Forth bridge

THE Essex Forth Microcard is a stand-alone language card which can be programmed using a BBC micro. It is designed for control applications and comes with 40 input/output lines and the Forth language 'on a chip'. Cost is £125.

A software package called *Forthwriter* streamlines program development and enables Forth files to be created using *View* or *Wordwise*.

Forthwriter costs £48 in 40 or 80-track format. Further details on (0206) 862286.

Bank expands micro scheme

MIDLAND Bank customers can now transfer money from one account to another with a micro and a modem, thanks to the Home Banking service – but it's being kept very quiet by the Midland.

Home Banking is like a *Prestel* service and allows customers to get instant balances and statements, order cheque books, check standing orders and interest rates.

After a year in operation the service has been upgraded to allow money to be transferred between Midland accounts – from your current to deposit account, for example. Unlike fully interactive electronic banking, such as the Bank of Scotland's, it cannot be used yet to pay bills.

Readers could be forgiven if they haven't heard about it. David Bayliss, who heads the project said: 'It's a test-bed service and at the moment we've got 1200 people using it. We couldn't handle any more so that's why we don't advertise the phone number.

'Most customers use a home computer, and most of those seem to be BBC micros.'

Camera prizes for Domesday photos

THE BBC Domesday Project is enlisting the help of the Women's Institute in its attempt to create an electronic version of the original Domesday Book. Already 13,000 schools have been signed up but they mainly cover the urban areas.

In the rural areas there are large gaps of knowledge, so the Domesday team has approached the Women's Institute, the Scouts and Guides Associations and farmers in a bid to cover these.

During the summer term schools will start entering the information they've collected into BBC micros, ready to be sent in disc form to the BBC, along with photographs of the area surveyed. The BBC will then compile a nationwide database of text and photographs on video disc.

There's also a photographic competition, open to all, with £4000 worth of camera equipment as prizes. All you have to do is take a photograph which reflects some aspect of modern life. There are six categories and the winning entries will go onto the Domesday video disc.

Further details from the Domesday Photographic Competition, Hemel Hempstead, Herts HP1 1JU.

Author's program gets BBC bird

BIRD-fanciers have the chance to win a BBC micro in a competition run by the BBC's Ceefax Telesoftware service. And it's partly due to *Acorn User* author, Peter Sandford.

Maps on bird migration can be downloaded by Beeb owners with a teletext adaptor. The maps use Peter's colour fill routine (January issue) to match areas of the UK to the migration patterns.

The prize goes to the person who incorporates this data in a program and comes up with the most imaginative application. The competition will be judged in September with a Beeb and three Electrons as prizes.

The telesoftware can be accessed via Ceefax page 701 with rules on page 703. The migration maps are displayed as conventional teletext pages on BBC 2, page 295.



The shape of things to come: Max Headroom, the world's first computer-generated TV presenter

On show

☐June 4-6, Phone 85 and COMPETA 85, Kensington Exhibition Centre, London. Two shows at the same venue, the first is for telephone users, the second covers computers and peripherals.
☐July 2-4, European Personal Robot Congress, London West Hotel. Three-day event comprising conferences, workshops and an exhibition. Further details on 01-236 4080.
☐July 25-28, Acorn User Show, Barbican, London. If you go to only one computer exhibition this year make sure it's this one!
☐July 29-31, MUSE Summer Course, Jesse Boot Conference Centre, Nottingham University. Further details on (0482) 20268.

On television

☐*The Learning Machine*, BBC1, 10.55pm on Thursdays. Series of weekly programmes aimed at parents and teachers, exploring how computers are used for education. Supporting leaflets and software lists available from Broadcasting Support Services, PO Box 7, London W3 6XJ (enclose sae).
☐*QED*, BBC1, 9.25pm on 29 May. A *QED* special on robotics.
☐*The Max Headroom Show*, Channel 4, Saturdays 6.00pm. Half-an-hour of rock videos linked by Max Headroom, the world's first computer-generated TV presenter. Good news for fans of the original Max Headroom pilot film: Channel 4 is to repeat it on July 7 and there are plans for a few 'one-offs' based on characters in the film.
☐Thames TV's *Database* returns in June. Starting on the 20th, the series of five weekly programmes goes out in the Thames TV region at 10.30pm on Thursdays, in the prestigious time slot straight after *News at Ten*. Details of individual programmes in next month's issue.

On radio

☐*Inside Information*, BBC Radio 4 VHF, 4.30pm on Sundays. A simple but comprehensive introduction to the world of information technology. Aims to be a 'self-learning package' and is tied in with a City & Guilds of London Institute assessment course. Presented by Paul Heiney, formerly with TV's *That's Life*.

For help

☐To contact *Acorn User* authors, write c/o the editorial address given on page 2.
☐Seikosha AP/GP100 printer help sheets are available from *Acorn User* for 50p, plus sae. These consist of three programs, including a screen dump, and three pages of notes on using this printer.
☐Monitor choice: Photocopies of our review of four monitors, plus a set of nine test programs from the June issue, priced 72p (inc post). A copy of the issue costs £1.25 (see page 93).

To contact

☐Technomatic's bulletin board service, containing information on products the company stocks, is open 24 hours a day on 01-452 1500. Baud rates: 1200/75 (Prestel compatible) or 300 baud.
☐Acorn's own dial-in viewdata service is on (0223) 243642. Baud rate is 1200/75.
☐Teachers interested in the Acorn Micros in Schools scheme can contact Acorn's education division on (0223) 245200.
☐The Fischertechnik robot kit is available from Economatics, (0742) 690801.
☐BBC TV's *Micro Live* bulletin board is on 01-579 2288 (type INFO BBC on Telecom Gold electronic mail system).
☐BBC Computer Literacy Project, Broadcasting Support Services, PO Box 7, London W3 6XJ. Please send self-addressed envelope.
☐Bulletin Boards:
CABB 01-631 3076
CBBS Cumbria (06992) 314
CBBS London 01-399 2136
Distel 01-679 1888
Forum 80 Hull (0482) 859169
Forum 80 London 01-902 2546
HAM-NET (0482) 497150
Liverpool Mailbox 051-428 8924
Mailbox 80 (0384) 635336
Microweb 061-456 4157
TBBS London 01-348 9400
TBBS Nottingham (0602) 289783
TBBS Southampton (0703) 437200
☐MEP (Microelectronics Education Programme), Cheviot House, Coach Lane Campus, Newcastle-upon-Tyne NE7 7XA. Hardware and software support for schools. Please send sae.
☐MAPE (Micros and Primary Education), c/o Barry Holmes, St Helen's Primary School, Bluntisham, Cambs. User group for primary teachers. Please send SAE.
☐MUSE (Micro Users in Schools and Education), Freepost, Bromsgrove, Worcs B62 7BR. User group for teachers and parents. Please send sae.
☐National Extension College, 18 Brooklands Avenue, Cambridge CB2 2HN. Educational and training courses on the BBC micro. Please send sae.

Blunderbox

☐In Mike McNamara's tip for removing markers in *Wordwise* (April, page 117), the control codes between the characters were omitted. It should read:

```
*KEY0!O¦!$¦!#A¦!$¦!#A¦
```

Gremlins crept into our May 'Treasure Hunt' competition. On page 114 the clue should have read:
Mozart = 41; Schubert = 8.5;
Brahms = 4; Beethoven = ?
There was also an error in the clue on page 11: The ninth figure from the right should have been 56.

☐The checksums provided in Colours by Interrupts (April, page 101) were incorrect. The checksums should be:
20203 21428 19413
☐Malcolm Banthorpe's Turtle program (February, page 107) contained a slight error in line 470: the + sign should be a − sign. This now means that you turn left when LEFT is entered rather than turning right.
☐Chris Davies' program to trap the Break key using the ON ERROR sequence (Beeb Forum, listing 1, page 107 April issue) contained a slight error. ERL in lines 550 and 570 should have read ERR.

How to present programs and articles

FIRST read the 'Notes for Authors' on the contents page.

Your submission should be original and have a practical use. We receive many articles on subjects we have already covered – often quite recently.

A neat and clear presentation is very important. A few hours' thought about how your article looks, diagrams, applications and documentation will ensure that it is evaluated quickly and efficiently, and is more likely to be accepted.

Program presentation is also important. Follow the 'standard' we've adopted in the yellow pages. Most importantly, your program must run on Basic 1. The only exception is if the program is of a Basic 2 tutorial nature. Basic and illegal calls to routines in the MOS should not be used. Program lines should increment in steps of 10, with the first four being REMed as per the format in the yellow pages.

Program listings should not be indented, and avoid multi-statement lines.

Use the standard assembler presentation, one mnemonic per line, upper case mnemonics with lower case labels. If the assembler is long include a checksum.

Provide a list of PROCs, FN's and variables detailing the operation of each on a separate sheet of paper, along with any hints or tips regarding entering the program.

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Econet User Guide	£5	

SOFTWARE

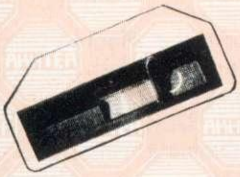
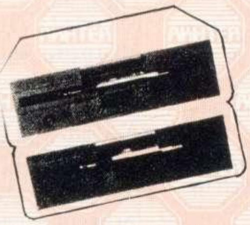
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MD100B	Single Drive 100k 40 Track Single Sided + PSU	£112 + VAT	£129
MD200A	Single Drive 200k 40 Track Double Sided	£112 + VAT	£129
MD200B	Single Drive 200k 40 Track Double Sided + PSU	£138 + VAT	£159
MD202C	Dual Drive 200k (2x100k) 40 Track Single Sided	£164 + VAT	£189
MD202D	Dual Drive 200k (2x100k) 40 T SS + PSU + Monitor Stand	£216 + VAT	£249
MD202E	Dual Drive 200k (2x100k) 40 T SS + PSU + Metal Case	£208 + VAT	£239
MD400A	Single Drive 400k 40/80 T switchable Double Sided	£130 + VAT	£149
MD400B	Single Drive 400k 40/80 T switchable D/Sided + PSU	£156 + VAT	£179
MD402C	Dual Drive 400k (2x200k) 40 T D/Sided	£217 + VAT	£249
MD402D	Dual Drive 400k (2x200k) 40 T D/Sided + PSU + Monitor Stand	£269 + VAT	£309
MD402E	Dual Drive 400k (2x200k) 40 T D/Sided + PSU + Metal Case	£260 + VAT	£299
MD802C	Dual Drive 800k (2x400k) 40/80 switchable D/Sided	£251 + VAT	£289
MD802D	Dual Drive 800k (2x400k) 40/80 switchable D/Sided + PSU + Monitor Stand	£303 + VAT	£349
MD802E	Dual Drive 800k (2x400k) 40/80 switchable D/Sided + PSU + Metal Case	£295 + VAT	£339

Utilities Included Are:

DISASSEMBLER ★ DUP ★ FORMAT ★ FREE ★ MDUMP ★
MERGE ★ RELOCATE ★ SDUMP ★ VERIFY ★ MENU ★

3M DISKETTES:

48TPI SS DD Diskettes (Box of 10)	£15 + VAT	£17.25
48TPI DS DD Diskettes (Box of 10)	£18 + VAT	£21.00
96TPI DS DD Diskettes (Box of 10)	£25 + VAT	£29.00

The Akhter Gold Standard

Due to the high standard of the Akhter Disc Drives we have taken the unique step of introducing "The Gold Standard" a TWO YEAR warranty on each and every one of our drives sold after April 1st 1985. To qualify for this 24 month guarantee the lucky purchaser merely returns his individual registration card included in every box to Akhter. Buy your drives with confidence ...... BUY AKHTER!

"An all in package then, which should reliably bring you into the rapidly growing fold of BBC disc system users" A+B Computing Feb '85.

AKHTER INSTRUMENTS LTD T/A
AKHTER COMPUTER GROUP
28/29 BURNT MILL
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ESSEX
CM20 2HU

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Telex: 818894 AKHTER G.

RET

Your BBC would not be without it

Solidisk Sideways RAM is indispensible to all BBC computers

SOLIDISK's SIDEWAYS RAM is an almost indispensible add-on for the BBC user.
It is available in either 32k, 64k or 128k byte capacity and is compatible with all issues of BBC microcomputers along with most of the add-ons and ROMs obtainable for it.
To date, more than 37,000 units have been sold.
The Sideways RAM occupies the right most ROM socket of the BBC and sits in the same position in the micro's memory map as the paged ROMs.
This means that the Sideways RAM can run almost all ROM type software including languages, utilities and filing systems.
The difference between Sideways RAM and Sideways ROM is that RAM can be written to meaning that only the presently required software has to be loaded into the machine, thus making redundant the multitude of high current consumption and often unsightly ROM extension boards.
Sideways RAM is also an invaluable tool for writing ROM type software to run on the BBC since software may be assembled straight into the area in which the final version will run. This will save a lot of time over using offset assembly and eprom programming/erasing on a non Sideways RAM equipped BBC.
For the user who is not interested in writing ROM type software but is in need of the utilities provided by the use of the Sideways RAM, we supply free software to make maximum use of the Sideways RAM facilities.
These are included in the Sideways RAM Software package, a collection of no less than 5 diskettes containing nearly 100 programs, from database, word processor, music system, sprite graphic, printer buffer, virtual memory, spelling checker, RAM disk, RAM filing system, VDU replay, disassembler, machine code monitor, macro basic, video digitised pictures etc. and Solidisk Most Advanced Disk Filing System version 2.0.
Another extremely useful feature is the ability to configure the Sideways RAM as a 'SILICON DISC' as in our STLDISC program. It makes use of available Sideways RAM as an extra disc drive.
Once the STLDISC program is loaded it acts exactly like a normal DFS with the exception that one drive is now allocated to the Sideways RAM. All operations on this drive are much faster than a physical disc drive and, of course, impart no mechanical wear to them. This means that programs may be repetitively loaded, saved, spooled or exec'd many times and only the final version need actually be saved to disc.
The extensive use of the facilities offered in the STLDISC program will allow the physical disc drives to go longer between services and the discs themselves to last longer and could in fact pay back for itself in a fairly short while.
The STLDISC program will operate on any size of Sideways RAM and will configure itself to the available space. Therefore a 16k board will give 4k bytes of storage, whereas the 32k will give 20k bytes and the 128k up to 116k bytes of 'Silicon disc' storage space.

PRICES

The listed price (effective from the 15 April onwards) comprises the Sideways RAM fully guaranteed for 1 year, comprehensive manual and a software package consisting of 5 diskettes formatted either in 40 or 80 track. Please specify when ordering.
— SWR32 (32k unit, by far the most popular): £58.95
— SWR64 (64k unit, new introduction model): £85.00
— SWR128 (128k unit, the second most popular): £149.00
As Solidisk Software Support Service has to produce in excess of 16,000 diskettes every month, we regret that we can no longer provide personalised service for disk copying. In extreme cases, when you need to update your software diskette, either reorder a new software package (which is always sold to you at nominal media cost (plus post and packing) or return the old package with £2.00 to cover post and packing. You may avoid post and packing costs if you call at Solidisk's stand at any BBC micro exhibition or at the Solidisk office.

UPGRADING

Upgrading from a smaller model is very simple: you return the old RAM board to us with your payment.
The listed prices include the full software package and new manual.

THE SOFTWARE PACKAGE

The Software package comprises of 5 diskettes, formatted either in 40 or 80 track. Please specify when ordering.

Volume 1:
Volume 1 contains all the general applications of Sideways RAM such as load and save ROMs (the Menu program), printer buffer (the Printer program), Improved Disk Filing System with unlimited catalog or PAGE at &E00 (STL0E00 and 2.0 ROM), Silicon Disc (the STLDISC program), the Quickcopy and the Fast Backup programs which use Sideways RAM to save you time and disk swapping effort.

Volume 2:
Volume 2 contains the Wordprocessor, Spelling Checker and the English Dictionary.

Volume 3:
Volume 3 contains the Macro Basic (a program generator), a Linker-Editor and the Virtual Memory Program, which lets you use Sideways RAM to store Basic programs thus allowing otherwise too large programs to run.

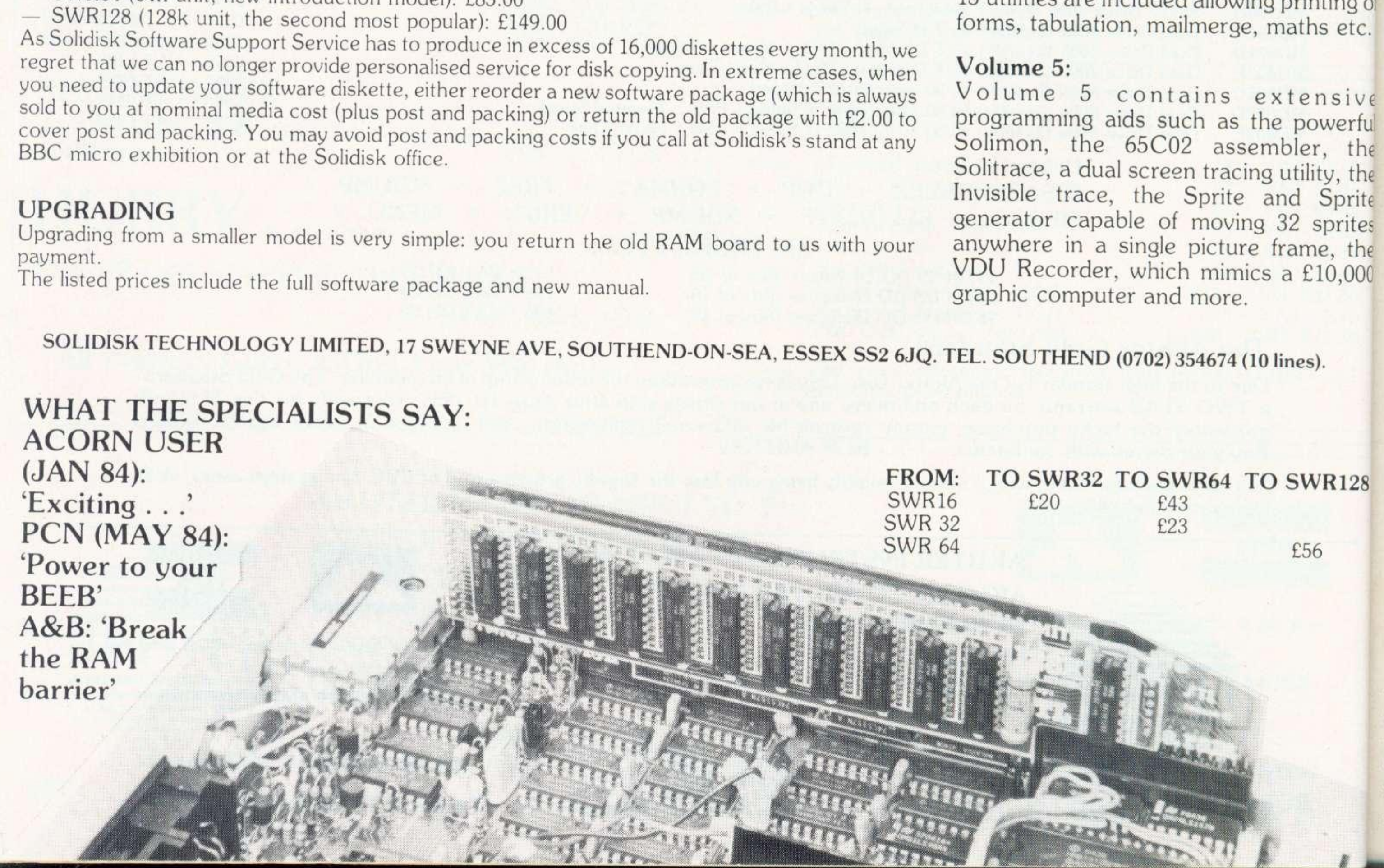
Volume 4:
Volume 4 contains a suite of programs, all part of the Solidisk Database system. This Database allows you to retrieve any record of up to 6500 records quicker than you can remove your finger; each record can have up to 15 fields of up to 60 characters long. 15 utilities are included allowing printing of forms, tabulation, mailmerge, maths etc.

Volume 5:
Volume 5 contains extensive programming aids such as the powerful Solimon, the 65C02 assembler, the Solitrace, a dual screen tracing utility, the Invisible trace, the Sprite and Sprite generator capable of moving 32 sprites anywhere in a single picture frame, the VDU Recorder, which mimics a £10,000 graphic computer and more.

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (10 lines).

WHAT THE SPECIALISTS SAY:
ACORN USER (JAN 84): 'Exciting . . .'
PCN (MAY 84): 'Power to your BEEB'
A&B: 'Break the RAM barrier'

FROM:	TO SWR32	TO SWR64	TO SWR128
SWR16	£20	£43	
SWR 32		£23	
SWR 64			£56



Introduced only last November the SOLIDISK DDFS has enjoyed an unprecedented popularity in a very short time. We think the reason for this is the ease and simplicity of installation and use, along with the capability of 60% extra disc capacity in the Double Density mode. This coupled with realistic pricing makes our DDFS an absolute best seller.

WHICH DFS DO YOU NEED?

SOLIDISK produce no less than three types of Disc Filing Systems to cover all your requirements.

1. THE FLEXIBLE DDFS

The basic SOLIDISK DDFS (£38.95) is suitable for all ordinary users. It is supplied with the SOLIDISK 1.9 ROM. This ROM is compatible with the ACORN DFS; running all unprotected commercial software and disks from Acornsoft (Elite), Micro Power (Castle Quest), Island Logic (The Music System).

The 1.9 ROM offers both single and double density formats, with built in disc formatter and verifying, along with such features as automatic density sensing and 40/80 track software controlled switching. The speed is now programmable by the keyboard links to suit almost any type of disc drive and the maximum file size is now only limited by the capacity of the disc.

The DDFS can now be supplied with the Solidisk Most Advanced Disc Filing System (our 2.0 ROM). The total price of this system is £48.95 and the specifications are outlined below.

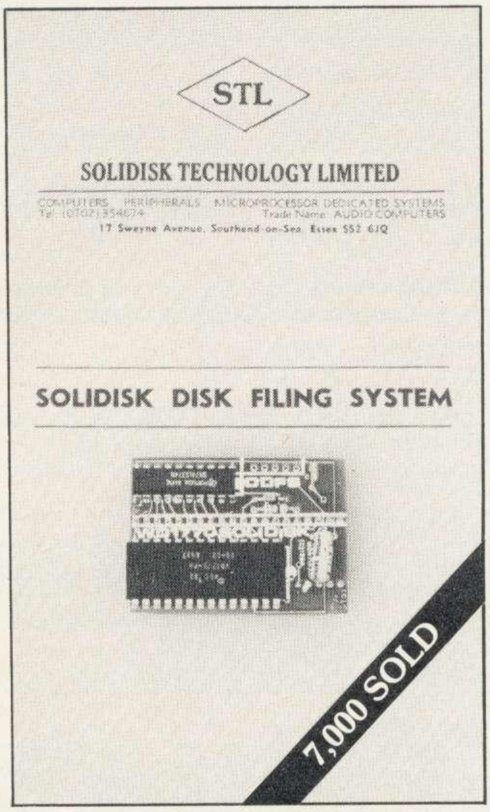
2. THE FAST 8″ CONTROLLER

This a totally new product intended for the business user where speed and reliability are paramount.

The date transfer rate of the 8″ look alike is double that of a standard 5.25″ double density formatted disc or an amazing four times that of a single density formatted disc. This gives a data transfer at the incredible speed of 500kbits or 64 k bytes a second.

This DDFS can be used with either 8″ disc drives or the Mitsubishi 8″ look alike or a mixture of the two.

Ideally suitable to be used with the Mitsubishi M4855 80 track double sided (2 MB unformatted or 1.3 MB formatted), the 8″ DFS costs only £69.95 inclusive.



3. THE SEDUCTIVE DFDC

Ideally suitable if you already have an Acorn DFS. The DFDC will not only add Double Density capability but also improve the speed of your 8271 chip.

The SOLIDISC DFDC (Dual Floppy Disc Controllers) is making a very large impact on the BBC user community with its extraordinary capability. It is currently supplied with the Solidisk Advanced Disk Filing System ROM 2.0 (£54.95).

The DFDC board simply sits in the place of the 8271 FDC chip (i.c.78) in the BBC. The 8271 is then inserted into the DFDC board and the ROM 2.0 inserted in place of the original DFS ROM.

Once the machine is up and running it is then simplicity itself to change FDCs; just throw the switch attached to the DFDC board, press BREAK and the other FDC is now selected.

This allows the user to get the best facilities available from both the 1770 and 8271 floppy disc controller chips with the minimum of fuss.

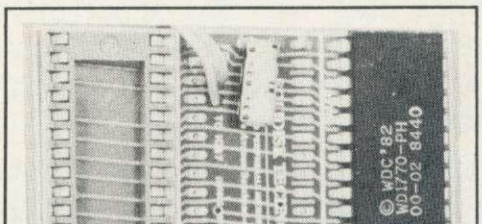
The DFDC board may also be used as a Stand Alone DFS if your BBC is not yet upgraded for disc systems. All the necessary chips and instructions are supplied and the 8271 may be added as an optional extra at a later date.

The SOLIDISK DDFS is now the ultimate in reliability with a minimum component count and software error trapping.

The DDFS consists of only 4 components to be plugged in to the BBC Microcomputer and can be fitted in just a few minutes by novice and expert alike.

Whilst many other manufacturers rely heavily on distribution outlets to do the selling for them, SOLIDISK relies on a good product and a large support network to win the heart of the user. With over 60 local experts, covering England, Scotland and Wales, a SOLIDISK National User Group in Holland and soon in Australia, SOLIDISK can offer many users regional free fitting and advice. Also with an ever increasing catalogue of free software, available to all SOLIDISK users, comprising of Programming tools, Graphic windows, Musical tunes, Spelling checker, Computer Aided Design, Disc utilities etc., even users who are new to the DDFS can expect to build up a large disc program library in a fairly short time.

Solidisk Software Support Service now has a responsibility to over 35,000 users and the ability to give you the best possible support matched only by the largest companies.



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17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ
TEL. SOUTHEND (0702) 354674 (10 lines)

SOLIDISK DFS ROM 2.0 IS OUT:

The Solidisk Advanced Disk Filing System for the BBC computer is now available for both Solidisk DDFS users and Acorn DFS users as an upgrade for the DNFS 1.2ROM.

Standard features include:

1) Unlimited Catalogue entries (up to disc capacity) without any special preparation.
With Computer Concepts's Disc Doctor or Watford's DFS, you have to specify BEFORE formatting if you want 62 filenames. Once formatted, you can no longer modify the format.
With ROM 2.0, there is no limit to the number of files and programs you can have on the same diskette. Until it is completely full.

2) Unlimited filesize.
This feature is sometimes a very good sales argument for databases.

3) Automatic Write Error Correction.
Every disk write operation is immediately followed by a read operation to ensure that the recorded data is free of all errors. Then if needs be, ROM 2.0 will restart the write operation from the unsafe sector.

4) Automatic 40/80 track stepping.
No other DFS allows you to directly backup a 40 track disk to an 80 track disk, even if you have a switchable disk drive, since the hardware cannot replace the software! ROM 2.0 allows you to backup and copy any 40 track disk to 80 track, single to double density (if available) even on the same drive without any special care.

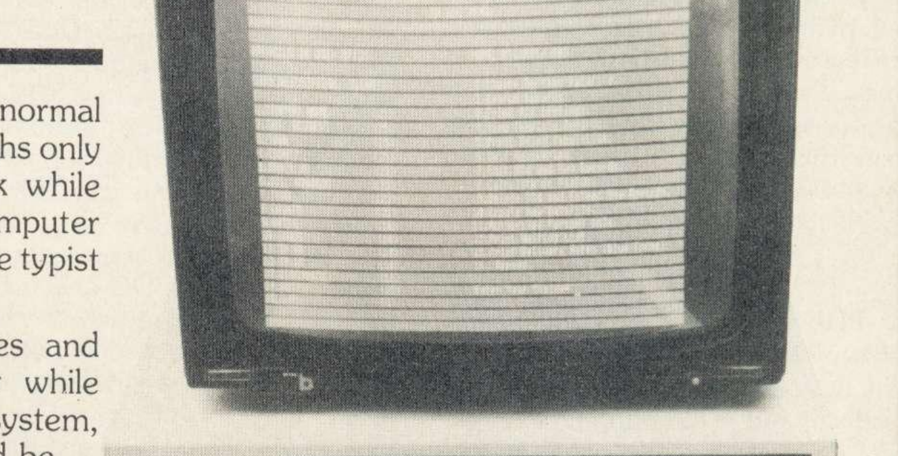
5) DISC REPAIR FACILITIES.
Disc sector editor (*DZAP), memory editor (*MZAP), recover good sectors (*RECOVER), re-write multiple sectors (*RESTORE), Read disk format (*R40 and *R80), recover bad sectors and bad track (*RTRACK), repair and restore bad sectors and track (*WTRACK) and the powerful disc copy (*DCOPY) which is capable of duplicating even some non BBC disks in under 1 minute in both single and double density (if available).

6) Tape to disc facilities.
This facility allows automatic transfer of all programs and most games to disk (*TAPEDISC and *LOADTAPE). Only in some cases (multi-part game cassettes), will you need Clare's utilities.

7) Wordprocessing facilities.
This facility allows !BOOT and other text files to be edited, saved and printed. Any screen mode and text up to 24k can be handled.

8) PRICE
The 2.0 ROM costs £20.00 to all Acorn DFS users. Included in the price are the Advanced DFS User Manual and VAT.
As an upgrade for the 8k Solidisk DDFS 1.9, the price is only £10.00 inclusive. Please note that you do not have to send back your present DDFS ROM when ordering, but post it later in the return envelope sent together with the 2.0 ROM, quoting your credit card number as a guarantee.

SOLIDISK KEYBOARD AND CPU ARE NOT JUST PRETTY . . .



The keyboard is 12 mm lower than the normal BBC case, 2-3 degrees more angled, weighs only 5lbs, does not skid about on the desk while enjoying 2 feet of freedom from the computer unit — and makes a lot of difference to the typist (even 2 fingered ones!).

The CPU accommodates 2 disk drives and withstands any heavy weight monitor while providing easy attachment for the whole system, CPU and disk drives, to the desk if need be. There is good ventilation to the power supply too and all untidy cables are hidden away.

PRICE

The complete CPU and keyboard case costs £30.00 inclusive + £3.00 post and packing. The system could be yours free as part of the Mitsubishi twin discs offer. Actually the best thing that happened to the BBC computer for a long time!

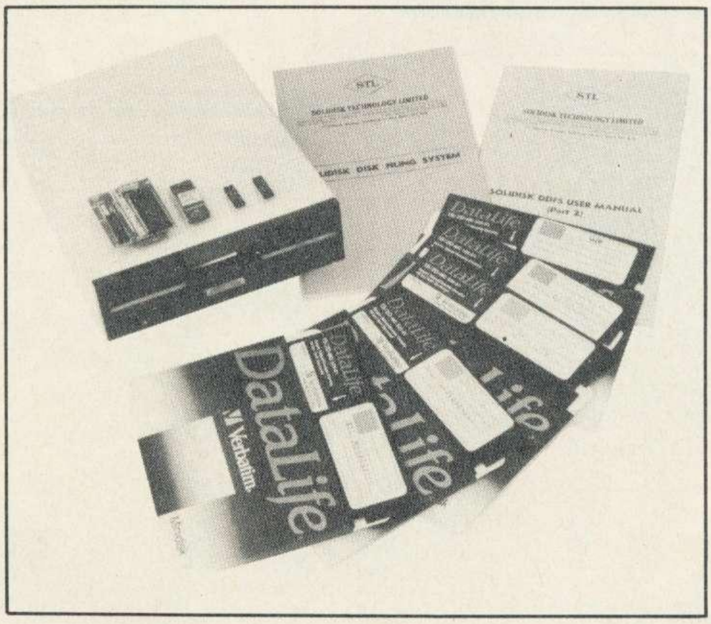
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SOLIDISK + MITSUBISHI BIG DEAL:

THE MITSUBISHI 640K DISK OUTFIT:
This offer comprises:

— One Double Sided, 80 track Mitsubishi M4853 disk drive, cased in beige.
— One Solidisk DDFS Single and Double Density Disc Upgrade.
— All leads and manuals (2).
— One Software package comprising 5 program diskettes as detailed below.
— Full one year guarantee.
— All for £209.95 inclusive of VAT and carriage.

IMPORTANT
If you upgrade (now or later) to twin Mitsubishi M4853 disk system, Solidisk will offer you, subject to stock availability, absolutely free a CPU and keyboard case as shown earlier.
For that, you have the choice of ordering a 640k Mitsubishi disk outfit now and then later on, of returning your disk drive, enclosing payment of £160 to cover the second disk drive and carriage. Alternatively, save by ordering right now a complete twin Mitsubishi (2MB unformatted, 1.3 MB formatted) Fantastic Offer at only £359.95 inclusive.



THE HARDWARE:
As described earlier as shown opposite.

THE SOFTWARE:
The software comprises 5 diskettes, formatted in 80 tracks. Volume 1 contains the Word Processor, Volume 2 the Database, Volume 3 the new Spreadsheet 1.1, Volume 4 the disc, tape utilities and a blank dictionary.
It would take several pages to describe them all. In general, they are of the highest standard as our hardware products. Only the first 2 volumes will be described below.

Volume 1:
Solidisk Word Processor and Spelling Checker with English dictionary. Easier than View, Wordwise or Scribe, you enter the WP by *WP (filename), then start typing. What you see on the screen will be exactly printed on paper.
You don't even need to read the manual twice, the most useful commands are all displayed on the top part of the screen.
This Word Processor features 80 column screen throughout, direct on screen justification, automatic margins, page numbering, printer special commands, Wordstar like editing commands for block move, block delete, block copy, print, save, load text to cursor, insert and overwrite, search and replace, total word count, word frequency count, free space, * commands etc, etc.
Solidisk WP loads and saves texts under 1 second flat and also you may save the edited version as many times and under any filename you like.
And also better than any other wordprocessor, you can spell check your document without leaving it, simply type in Control-U.
It has self dictionary generating capability too. You may create any dictionary you like simply by entering the words.
Solidisk WP is also excellent as a training tutor for Wordstar, as used on most 16 bit computers.

Volume 2:
Solidisk Database. Solidisk Database is a random access system, completely menu driven and more importantly, very easily customised to suit any particular need.
Important features include unlimited filesize and number of records, all maths functions and 80 column screen throughout. Solidisk Database is particularly simple to understand and easy to use. You are first presented with an option menu, which comprises 15 different options. Each option will then lead to a new menu and so on. Mostly you only have to enter an appropriate data or hit the RETURN key.
You can design a new database, list all records, edit them, merge them, split them, making mailshot with Solidisk WP etc. For instance, Solidisk telephone enquiries are dealt with by an ordinary BBC with twin Mitsubishi holding the last 4000 sales records. Typing in the name you retrieve the complete record quicker than you can remove your finger. It of course runs Solidisk Datafile.

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NEW PRODUCT ANNOUNCEMENTS

Solidisk MODEM.
Single chip FSK, Multistandard internal MODEM, requires no soldering, no adjustment.
Supplied with Menu Driven SoliComms 16k ROM, ready to be connected to any information provider such as Prestel or Gold. Auto dialling, auto answer, auto baud rate, auto error correction.
Available soon. Price: £39.95 inclusive.

Solidisk Third Processor
Internally fitted 6502 compatible with Acorn Second Processor, 128k as standard, upgradable to 256k, 4 Sideways ROM sockets, software supplied in ROM allowing unused RAM to be loaded with Sideways Software or used as Silicon Disk. Available soon.
128k 6502 TP: £179.00 inclusive.
256k 6502 TP: £229.00 inclusive.



IN STOCK:

1) NEW LOW PRICE EPROMS.
2764s and 27128s are going down in price.
5 x 2764s now cost you only 24.95 per pack.
3 x 27128 now only 25.95 per pack.

2) PLENTY OF UVIPROMS AND UVIPACS.

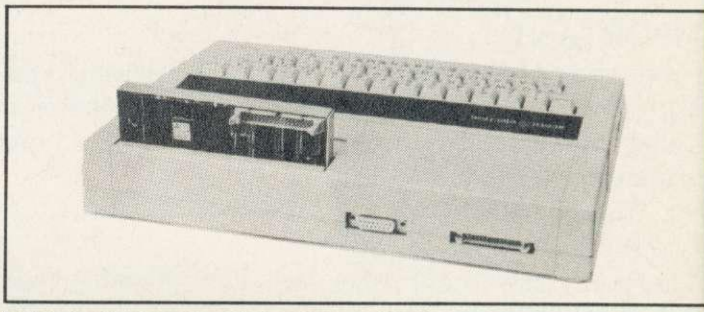
3) ELECTRON DISK INTERFACE.
This interface is BBC compatible and includes 3 Sideways ROM sockets.
It Plugs into the PLUS-1 and allows direct attachment of disk drive and software compatibility with BBC disks.

PRICE: £39.95 inclusive, P&P: £1.00.

SOLIDISK LOCAL EXPERTS

We have people able to fit your equipment free of charge in all the following towns. If your area is not mentioned, ring the office!

Dunstable, Leighton Buzzard, Reading, Peterborough, Wimslow, Penzance, Torquay, Wimborne, Basildon, Stroud, Southampton, Hoddesdon, Watford, Bexley, Margate, Rochdale, Boston, London (all areas), Oldham, Hunts Cross, East Dereham, Rushden, West Bridgford, Wantage, Bambury, Grimsby, Kingston, New malden, Woking, Taunton, King Norton, Sutton Coldfield, Halesowen, Leamington Spa, Hassocks, Salisbury, Swallowne, Leeds, Huddersfield, Treowen Newtown, Newtownards, Co Fermanagh, Co Londonderry, Le Mesnil St Denis (France), Kalgoolie (Australia), Paramatta (New Sth Wales), Manawatu (New Zealand).



Short form price list. Full price list on request.

Qty Items	Prices	P&P
Sideways RAMs:		
SWR32	£58.95	£1.0
SWR64	£85.00	£1.0
SWR128	£149.95	£1.0
CPU & Keyboard Case (both)	£30.00	£3.0
Solidisk DDFS.		
DDFS (with 1.9 ROM)	£38.95	£1.0
DDFS (with 2.0 ROM)	£48.95	£1.0
DFDC (with 2.0 ROM)	£54.95	£1.0
8″ Controller	£69.95	£1.0
Special Offers.		
640k Disc Offer	£206.95	£3.0
1.3MB Fantastic Offer	£356.95	£3.0
Eprom Equipment.		
Programmer	£19.95	£1.0
Eraser	£19.95	£1.0
2764 x 5 new low price	£24.95	£1.0
27128 x 3 new low price	£25.95	£1.0
Datalife Diskettes.		
MD525 SS/DD	£17.00	£1.0
MD550 DS/DD	£22.00	£1.0
MD557 2S/4D	£28.00	£1.0
65C02 with Software	£13.00	£1.0
Solimon-2 16k ROM	£13.00	£1.0
2.0 DFS 16k ROM	£20.00	£1.0
	Total =	

Name: ______________________

Address: ______________________

Barclay/Access: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Prices and specifications correct at time of going to press: we do reserve the righ[t] however to change without prior notice.

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (10 lines).

GET YOUR HANDS ON A...



AND YOUR FINGERS WILL NEVER STOP FIRING!

Firing in all directions because Fistful of Fun is the latest compilation special from Alligata that brings together the action-packed excitement of 'shoot up' spectaculars with the nerve jangling demands of platform classics. Only Alligata compiles so many hit titles in one bargain buy that's sure to prove a hit with all the family.

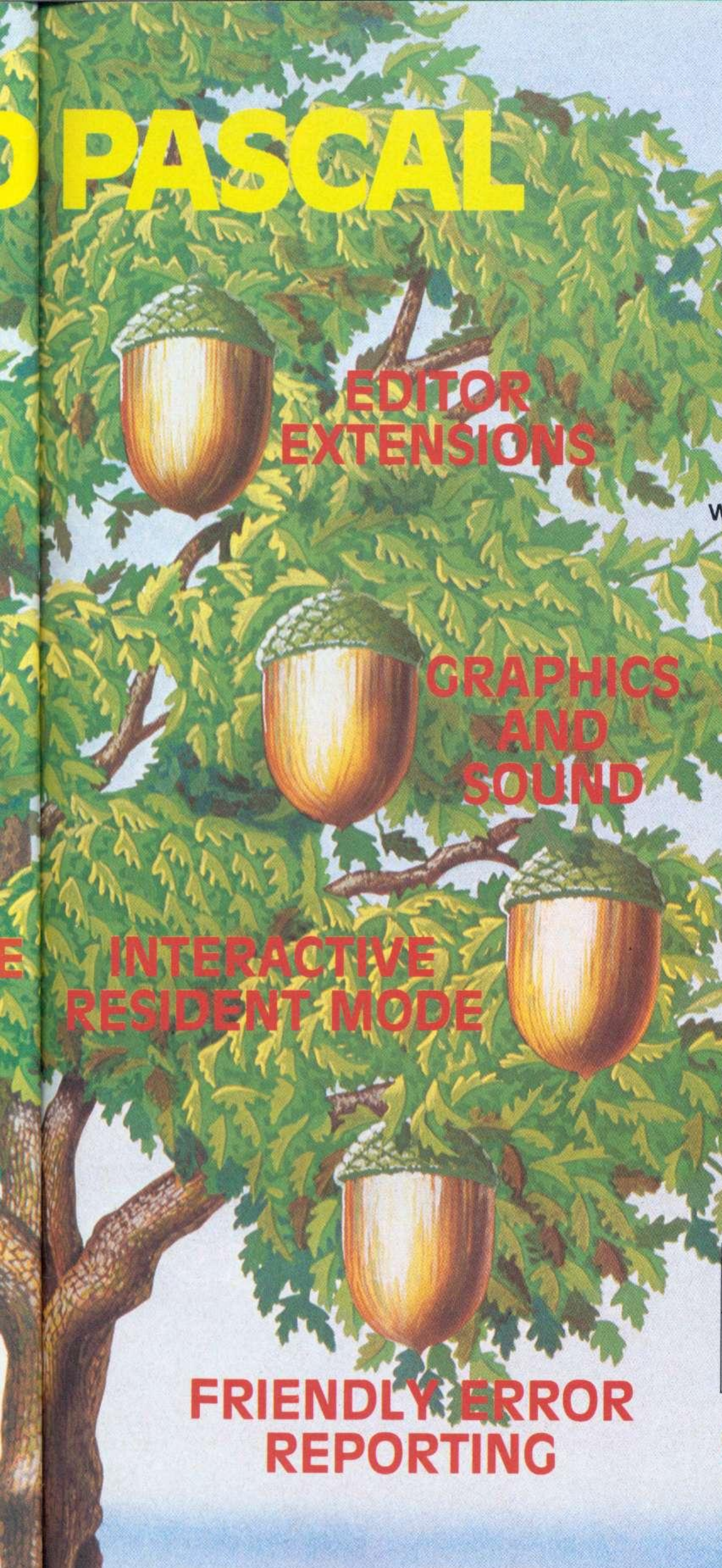
TAPE £9.95

Alligata Software Ltd

DISK £11.95

Alligata Software Ltd.,
1 Orange Street,
Sheffield S1 4DW
Tel: (0742) 755796

Send for full colour product brochure (enclose a stamp)



BBC and Electron

Friendly Error Messages

Many compilers produce little more than an error and line number to help correct mistakes in Pascal programs. Oxford Pascal however, gives you one of 49 friendly and informative error messages, messages which not only indicate the reason for an error, but also print out the line in question with a pointer to the exact position where the error was detected. Run-time errors are reported using line-numbers from the original source-program with a full explanation of how the error occurred.

Powerful Editor

With Oxford Pascal there is no need for you to learn how to use a new Editor. Pascal programs can be entered in exactly the same way as BASIC programs, without the need to learn any new commands. When you are used to using Pascal, you will find our extensions to the Standard Editor even more useful. What is more, Oxford Pascal allows you to mix BASIC and Pascal together, in much the same way that you can mix BASIC and assembler. In fact you can, if required, mix all three together...BASIC, Pascal and assembler...in one program.

Stand Alone Code

Unlike other compilers, Oxford Disc Pascal allows you to compile on the BBC and then relocate your program so that it will run on the BBC **and** on the Electron. The relocated program will run without a Pascal ROM and can be loaded and run from tape or disc just like any other program.

This means that you can distribute or sell your software freely and without the need for **ROM**s, to run on either of the above machines.

Price/availability matrix

	BBC 'B'	ELECTRON	C64	SPECTRUM
DISC	£49.95	Not yet!	£49.95	Available April 1st 1985
CASSETTE	£39.95	£59.95 inc. Cartridge	£22.95	

All prices are inclusive of VAT   Please add £2.00 for postage and packing.

Oxford Compilers —The Future

During the next year, we at Oxford will be releasing a series of language implementations such as C, and Modula 2, for the BBC, and other popular micros.

These compilers are being built, using the most modern techniques in **automated** compiler construction, and will bring to the micro-user, a level of robustness and efficiency, only now becoming available to mini and mainframe users.

Oxford... the **Compiler Compilers.**

Oxford Computer Systems (Software) Ltd.
Hensington Road, Woodstock, Oxford OX7 1JR, England
Telephone (0993) 812700   Telex 83147 Ref. OCSL

...s don't grow on trees

Oxford Pascal Order form. Please make cheques payable to OCSS Ltd.
Please rush me my copy of Oxford Pascal. I enclose £ .... including £2 postage and packing
My computer is BBC 'B'☐ ELECTRON☐ C64☐ (Please tick as appropriate)
I would like my compiler supplied on DISC☐ CASSETTE☐
Name ....
Address ....
Postcode ....
Telephone ....

The World of CPM

Enter the World of Business Computing with GSL Winchester Systems.



***GWFS**

GWFS is a sophisticated Winchester filing system for a wide range of Business, Scientific and Educational markets using the BBC micro.

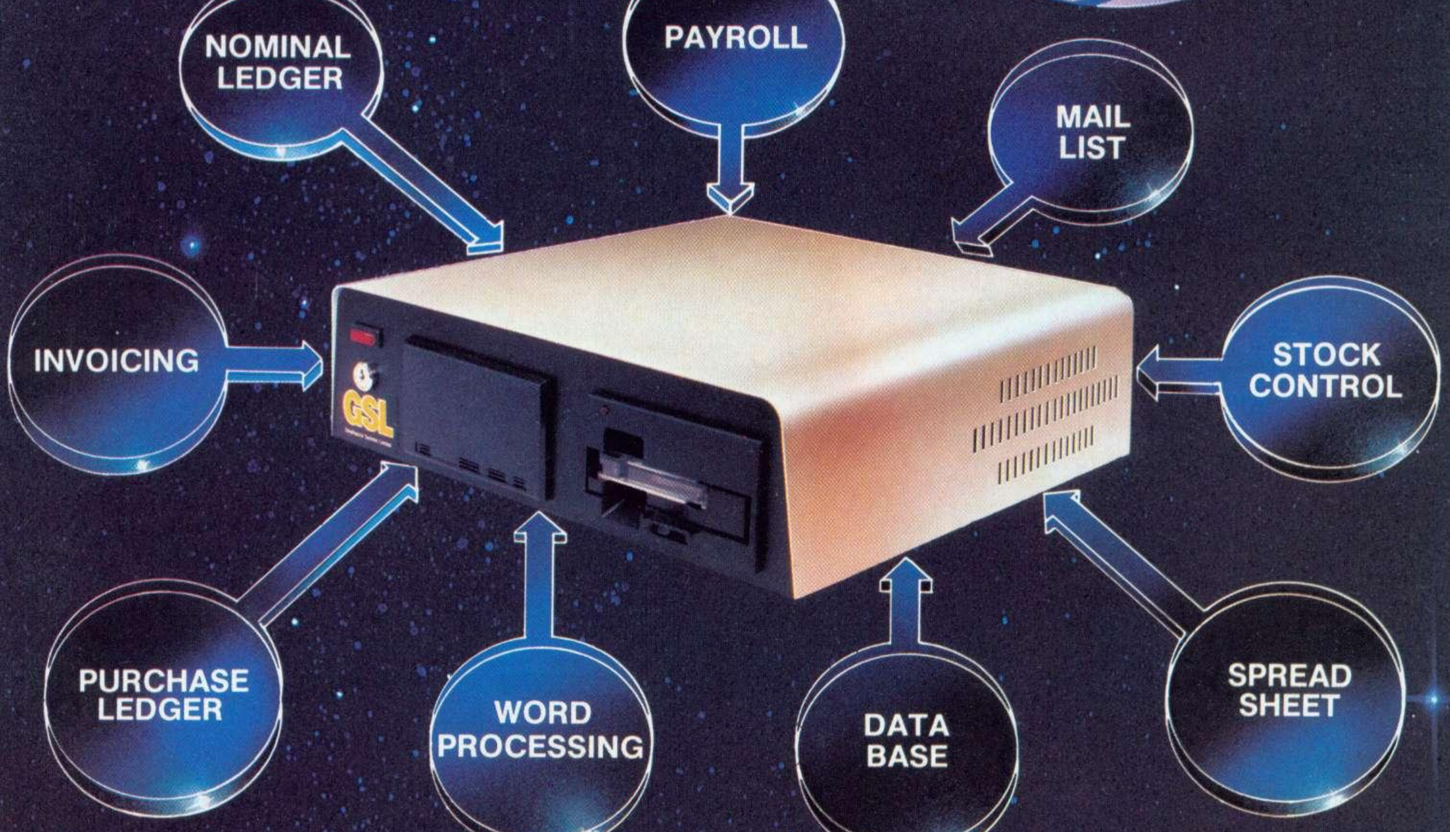
GWFS can be used as a stand-alone system giving capacities of up to 120 MB. It can also be used in conjunction with Acorn's Z 80 second processor to allow the use of CPM programs, thus giving access to low cost computing with high storage capacity, password protection, mail facility, flexible storage hierarchy.

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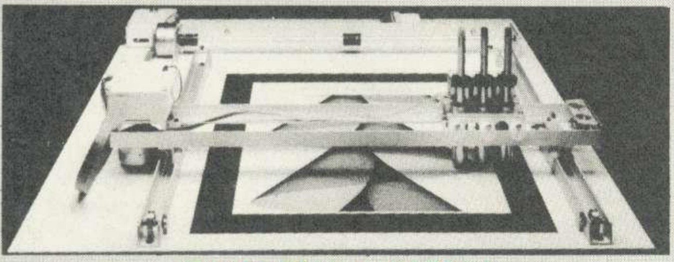
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KAGA KX1201G Hi Res 12" Etched Green Screen	£99(a)
KAGA KX1202A Hi Res 12" Etched Amber Screen	£105(a)
PHILIPS DGD Hi Res Green Screen	£75(a)
ZENITH 122 Hi Res 12" Amber Screen	£68(a)
Swivel Base for Kaga Monochrome fitted with Digital Clock	£21(c)
Monitor Plinth for the BBC	£13.50(b)
Double Tier Plinth for BBC and flat pack dual drive	£19.50(b)

BBC Leads Kaga RGB £5(d) Microvitec £3.50(d) Monochrome £3.50(d)

RB2 TRACKER BALL

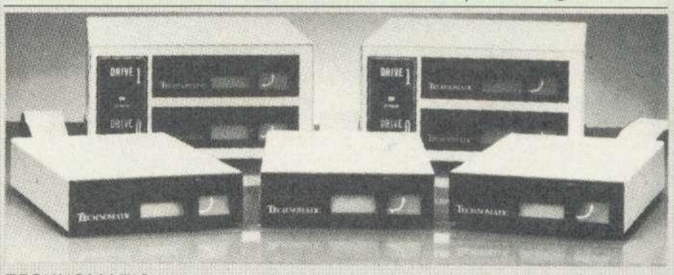


Marconi with its years of experience making tracker balls for use in Military and Air Traffic Control have developed a quality device for the serious hobbyist, for educational uses, and for low cost CAD/CAM applications. RB2 is a compact, ergonomically designed tracker ball that provides precise positional control and rapid direction changing using a freely rotating resin ball in any direction without the limiting stops or the zero point drift of joystick controls. Three switch buttons enable easy software manipulation to incporate the use of the tracker ball. Appropriate software will enable the RB2 to take over the functions of cursor keys in word processing, CAD/CAM applications and two dimensional positional controls of robots, drillheads etc. RB2 which plugs into the user port is supplied with utility programme to use it as a joystick with other software, a comprehensive graphics/CAD program and a program demonstrating its editing capabilities. User guide includes instructions on writing your own programs for the RB2. **£52(b)**

AMX MOUSE

In conjunction with a controlling ROM this sophisticated mouse has many advanced features such as Icons, Windows etc., these can be used in ordinary programs as well as sophisticated CAD Design. The supplied 'AMX ART' is a superb, yet simple-to-use CAD package allowing the creation of amazing graphical designs. A screendump for drawings is included. It can also be used with Wordwise/View to replace the cursor keys. Supplied complete with CAD Package, ROM and full instruction manual. **£69(b)**

DISC DRIVES



TECHNOMATIC drives are fitted with high quality slimline Mitsubishi mechanisms and represent the state of the art in drive technology. The drives are built to the highest standards and are tested to their full performance capability before packaging.

All drives are available with or without integral mains power supply. The dual drive power supplies are switch mode type and are generously rated to ensure minimum heat generation even over long periods of operation. All drives with integral power supply are fitted with a mains indicator.

The drives are housed in attractively designed metal casings painted in hard wearing BBC matching paint. The dual drives can be supplied in stacked version or with built-in plinths. The plinth version cases are of sturdy construction to carry any monitor and provide a simple method of having a compact computer installation.

The 80T drives are supplied with the 40/80 track switching modules at no extra charge. The 40/80 track switches are conveniently positioned to enable easy switching between the tracks.

All drives are supplied with all the necessary cables, manual and a formatting disc. The mains powered drives are also fitted with a 13A mains plug suitably fused. The drives are ready to be fitted to the computer. All drives are capable of operating in single or double density modes.

Single Drives:

1 × 100K 40T SS	TS100	£85(b)	PS100 with psu	£125(b)
1 × 400K 80/40T DS	TS400	£125(b)	PS400 with psu	£149(b)

Dual Drives:

Stacked Version:

2 × 100K 40T SS	TD200	£175(a)	PD200 with psu	£200(a)
2 × 400K 80/40 DS	TD800	£250(a)	PD800 with psu	£290(a)

Plinth Version:

2 × 100K 40T SS	TD200P	£195(a)	PD200P with psu	£220(a)
2 × 400K 80T DS	TD800P	£265(a)	PD800P with psu	£305(a)

DISC DRIVE MULTIPLEXER

A simple device that enables up to four computers to be connected to one single or dual drive. Ideal unit for installing in classrooms where networking is not planned or necessary or the costs have to be kept low or where software information is shared. Several of these units can be installed in series to connect more computers to access the same discs. Units supplied with 5' of cable per outlet as standard. Mains powered.

TDM 4 Quad Unit (upto 4 computers) **£135(a)**
TDM 2 Dual Unit (2 computers) **£75(b)**

Note: All computers must be fitted with a DFS

3M FLOPPY DISCS

Authorised Distributor
Data Recording Products

3M

Industry standard high quality discs with guaranteed error free performance for life. Discs in packs of 10:

40T SSDD £13(c)	40T DSDD £18(c)
80T SSDD £22(c)	80T DSDD £24(c)

FLOPPICLENE DRIVEHEAD CLEANING KIT

The FLOPPICLENE drive head cleaning kit is an ideal way to ensure the optimum performance of your drives. The use of disposable cleaning discs eliminates the risk of contamination and abrasion of sensitive driveheads. These risks are normally inherent in the reusable drivehead cleaning kits. Floppiclene with 20 disposable cleaning kits. **£14.50(b)**

DISC ACCESSORIES

Single Disc Cable **£6(d)** Dual Disc Cable **£8.50(d)**
10 Disc Library Case **£1.80(d)** 30 Disc Case **£6.00(c)**
Lockable Storage Boxes 40 Discs **£14(c)** 100 Discs **£19(c)**

COMMUNICATIONS

MODEMS

ACORN PRESTEL: The official Acorn add-on — an advanced BT Approved. Auto-Dial, Prestel Terminal ideal for British Telecom Gold. Comprehensive software includes 'tagged' frames, downloading of Telesoftware, saving of frames, printing, sophisticated 'Mailbox' handling c/w editor. A built-in speaker allows line monitoring. A simple !BOOT file allows automatic operation **£99(b)**

BUZZ BOX A full spec, BT approved, pocket size, direct connect modem with both originate & answer modes, full & half duplex, allowing access to many databases, bulletin-boards as well as Intercomputer communications. It conforms to CCITT V21 300/300 Baud Standard. Battery/mains powered **£62(c)** BBC Lead **£6** External PSU **£9(c)**

MINOR MIRACLES WS2000 A world standard modem, having BT approval, covering V21,V23,BELL 103/113/108 and including 75,300,600,1200 Baud ratings. (It even includes 'reverse Prestel'!). This is the modem that will cover 'Prestel' type systems as well as Bulletin Boards both in the UK and abroad. What possibly gives this modem its biggest advantage is its option of computer control. A 25Way RS232 input as well as possible computer controlled auto-dial/auto-answer makes this modem unique. WS2000 **£129(c)** BBC Serial Cable **£7**



WS2000 Auto-Dial card: includes an integral loudspeaker for monitoring of the phone line **£30(d).**
BBC User Port cable (for modem control) **£7.**
SKI KIT (Allowing total control of the modem by your computer) **£10.**
DS1 Disc (for Commstar): When used with the Auto-dial card, SK1 Kit, and a user port cable, this software will dial out to Prestel, enter your password etc. and leave you in Commstar. Will also store many bulletin board telephone numbers for autodialling **£10.**
WS2000 Auto-Answer Card £30(d).
(Please note that the A/D & A/A Cards are still awaiting BABT Approval.)

DEMON A High Performance, yet low-cost Modem. Features include: Auto-dial & auto-answer, Auto baud rate scan, 75,300,1200 Baud rates with V21, V23 and Bell standards. Sophisticated software in ROM allow many features like: Auto-Dial. Redial, Remote facilities etc. An Auto-Dial disc allows storage of commonly dialled numbers. UNICOM **£49.95(b)** Unicom ROM **£20** Unicom Disc **£9.95** Unicom Cable **£6(d)** Not BT approved

COMMSTAR An ideal communications Rom. Extremely easy to use, yet very versatile. It features both a Prestel mode as well as a Terminal mode, thus offering very good value for money. In Prestel mode, all normal Prestel features are available including, downloading of software, saving and retrieving of pages on disc, page tag, revealing of hidden text etc. Its terminal mode is ideal for bulletin boards etc. All input may be copied into a buffer in memory over which full control is available. Controls of protocols are very simple and any type of file, (not just ASCII) may be sent using XModem protocols. Even includes an elapsed time-clock. **£29(d)**

TERMI-II A good all round package for communicating with notice boards, electronic mail services etc. Termi is a semi-intelligent terminal emulator allowing the BBC to act as a dumb terminal, slave BBC graphics terminal, or VT52 terminal. The rates at which data is sent or received is easily set up with rates of up to 4800 Baud with 40/80 col. selectable. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Termi is not suitable for PRESTEL). **£28(d)**

COMMUNICATOR This is a full 80 col VT100 terminal emulation program on 16K eprom. It is a more advanced program than TERMI and features easy to follow screen menus. The rate at which data is sent or received is easily set up with rates up to 19200 Baud with 80 column text. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Communicator is not suitable for PRESTEL). **£59(d).**

SMARTMOUTH

The original 'infinite speech' synthesiser. A ready built, self contained speech synthesiser unit attractively packaged with a built in speaker. Plugs into the user port. **£24(c)**

TECHNOMATIC

All prices exclude VAT

EPROMER II



A sophisticated eprom programmer that handles the full range of single rail eproms (incl 27256) and allows the user full control of the programming process.
Its powerful menu driven software makes the programming of eproms simple, efficient and eliminates the need to have fiddly switches for selecting eprom types, programming voltage or method. The features include:

* Integral power supply ensures no power drain from the computer.
* Interfaces through 1 MHz bus, fully buffered and complies with the Acorn protocols.
* Eproms upto 16K (27128) programmed in single pass.
* Selectable programming voltage 25/21/12.5V
* Selectable programming method — normal or high speed algorithmic. High speed programming enables 27128 to be programmed in just over 2 mins. Normal programming skips addresses FF data to increase programming speed. Automatic verification on completion of programming.
* User can select any section of the eprom from a single byte to its full address range to Blank Check/Read/Program/Verify enabling program development/changes very simple.
* Full screen editor with HEX/ASCII input.
* Full tape/disc filing facility. Data input from keyboard/Tape/Disc/Eprom.
* Constant display of all options selected.
* Several BBC BASIC programs can be entered on a single eprom.

EPROMER II with Manual & Cassette **£99(b)** Software on disc **£3** ROM based software **£10**

ATPL SIDEWISE ROM EXPANSION BOARD

This is a well constructed expansion board, that does not require soldering in its installation. All buses are buffered. It allows full sideways Rom expansion to a total of 16 ROMs. One socket has been split into two 8K sockets to allow the use of 8K byte CMOS RAM chips, giving a total of 16K sideways RAM. This is ideal for sideways rom development, and will also allow downloading of software from cassette or disc. The battery backup option will allow retention of data in the RAM, when power to the computer is removed. Several link-selectable options include the choice of type of Eprom, and a 'write-protect' for the RAM option. **£39(d)** Back-up Kit **£18.**

UV ERASERS

UVT1T Eraser with built-in timer and mains indicator. Built-in safety interlock to avoid accidental exposure to the harmful UV rays. It can handle up to 5 eproms at a time with an average erasing time of about 20 mins. **£59(b).**
UV1T as above but without the timer. **£47(b).**

'TIME-WARP' REAL-TIME CLOCK CALENDER

We have broken the price barrier! A low cost unit, allowing the facilities of units costing far more. Built to professional standards, it opens up the total spectrum of Real-Time applications. Possibilities include desk diary/planner, calender, continuous display of on-screen time and date information, automatic document dating, precise timing and control in scientific applications — its uses are endless. Simply plugs into the user port — battery backup is supplied as standard. A full manual as well as Extensive software on cassette (easily transferred to disc) — no ROMs needed. **£29(c)**



RAMROM-15

The advanced sideways ROM/RAM expansion system. This is an external unit, using high quality construction, attractively packaged in a BBC coloured metal case, allowing easy access to all the sockets. (Allows other units to be fitted inside the BBC). Absolutely no soldering is required. Allows 11/12 additional sideways ROMs to be fitted with an option of up to 16K sideways RAM. All commonly available RAM can be used i.e. 4801/6116/6264 or xx128. All the hardware to take the RAM is already fitted e.g. battery backup. For development work and further expansion, most of the 6502 processor signals are available. Supplied with utility disc and full instruction manual. **£112(b)**

01-208 1177

Please add carriage: (a) £8; (b) £2.50; (c) £1.50; (d) £1 and VAT at 15% to order. Carriage (a) sent by Datapost

TECHNOLINE

TECHNOLINE is a VIEWDATA system we have set up to enable our customers to get up-to-date information and prices on our products at any time of the day or night. It also allows the viewer to send correspondence and orders to us at any convenient time. Needless to say, using this 'latest technology', enables us to yet further improve on our fast response to customer requirements.

THE SCROLL

We are about to launch a revolutionary new concept in Word Processing, that will raise the standard of BBC word processors.

Among its revolutionary features are:

1. A supplied 64K ram card allows a genuine 64K of text storage.
2. 40/80 Column use is easily selectable.
3. A special non-volatile 2K ram, stores (even when the BBC is switched off!) both pre-defined document configurations, and pre-defined printer drivers. This allows you to take full advantage of many and varying printer facilities, such as Italics, Bold, Underline, Shadow etc., with ease and simplicity.
4. A unique facility allows user access to the 64K Ram and 2K Non-volatile RAM.

Not priced for the lower end of the market, this product is aimed primarily at the professional user who spends a considerable period of time using a word processor, and is not satisfied with 'hobby' type products. We feel that we have reached a high standard with this product — that it has achieved the delicate balance between sophisticated features and an elegant ease of use.

Detailed specifications to be released soon.

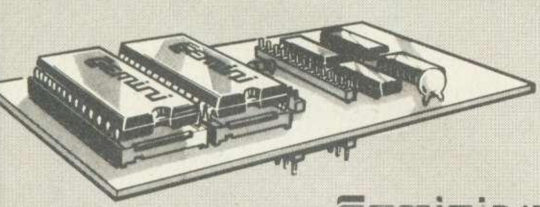
ACORN IEEE INTERFACE

This interfaces enables a BBC computer to control any scientific and technical equipment that conforms to the IEEE488 standard, at a lower price than other systems, but without sacrificing any aspect of the standard. The interface can link up to 14 IEEE compatible devices. Typical applications are in experimental work in academic and industrial laboratories, with the advantage of speed, accuracy and repeatability. The interface is mains powered and comes with cables, IEEEFS ROM, and user guide. £282(a)

ACORN MUSIC 500

Convert your BBC micro into a sophisticated music composition aid and sound effects generator. Custom made software will provide you with the flexibility to compose, experiment, perform and teach music. Stereo output can be connected to a sound system including your home stereo unit. Full specification on request. £174(a)

DATABASE MANAGEMENT SYSTEM



Gemini DATAGEM

The Definitive Random Access, 24K ROM Based DATABASE MANAGEMENT SYSTEM.

Datagem is the first truly flexible database for the BBC Micro that can make your system really useful and efficient, saving you money in the long run. The system includes a carrier board containing two Eproms, demonstration applications disc in both 40/80T, professional documentation with quick reference card, and 'Trans' utility program. Features include: *almost unlimited file size (max 10MByte) *supports up to 4 drives *Max of 5000 records per file *max 6K record size *max of 62 fields *9 level hierarchical search system with facilities to store results of searches. Searches can be any one of the following: Search, Include, Exclude, Combine, Common or Difference *user defined variables *generates form letters from records. Please ask for leaflet. £112(c).

STARdataBASE A fast machine code, true random access database program in a 16K Eprom. Up to 4096 records in a file, up to 69 fields in a record. The record layout is totally user defined. Entirely menu driven — thus very user friendly. Extremely fast searches are possible using the Keysearch facility. Mailmerging from View and Wordwise, and address labelling. Its printer configuration suits any BBC compatible printer. £75(d)

ROMs/SOFTWARE

VIEW Acorn's new version V2.1 word processor rom. Advantages include printing straight from memory and editing in any mode. £48(c)

HI VIEW Disc based version of VIEW word processor for use with the 6502 2nd processor. Allows 47K of user memory. £52(c)

VIEW INDEX Disc based program to create an index from VIEW text files. Ideal for anyone concerned with writing extensive reports or books. £13(d)

WORDWISE One of the most popular word processors for general use **£34(d).** Wordwise SpellCheck Disc — A must for any serious word processor user. Normal price **£16.50(d).** If bought with Wordwise: No p&p and only £14.

WORDWISE PLUS The new advanced Wordwise on a 16K eprom, for the more specialised users who require added features and flexibility. New facilities include: 2nd Processor compatible allowing 80 column previewing in all cases, a new Basic-like language, new editing features and embedded commands etc etc. Four new programs are also supplied allowing mail-merging, index generating, two-column text printout and continuous processing. A new 56 page introductory manual and a 180 page reference manual complete this rather special package. Finally, it is able to use existing Wordwise files without any modification. £49(d).

SPELLCHECK II: A rom based fast machine code program that works with both VIEW and WORDWISE. Vocabulary disc supplied with 6000 words can be expanded to well over 17000 words on 100K drive. Fully compatible with 6502 second processor. £26(d)

ISO-PASCAL: Acorn's full implementation of International Standard Pascal on two 16K ROMs. Disc Version for use on 6502 2nd Processor also supplied. Comprehensive manual. £60(c)

ACORN LOGO A full implementation of the Logo language from Acornsoft. Supplied as two ROMs with a tutorial course and technical manual. £60(b)

ULTRACALC 2 This enhanced version of the original BBC Publications popular spreadsheet rom includes many new features including full compatability with the 6502 2nd processor running as HiCalc allowing 44K of user memory, operate in any mode, greater flexibility in printer control, spooling as ASCII file etc. All these features are in addition to the existing powerful features such as handling of labels and numbers as values. Column width control and features normality found in well designed spreadsheets. £69(d)

VIEWSHEET Acorn's spreadsheet provides 255 columns and 255 rows and will operate in any mode. Windows can be created which can then be rearranged to provide any print format required. Function keys provide for easy entry of commands. Printer control codes can be used using the printer driver. Fully compatible with VIEW and the 6502 2nd Processor. £52(d)

BCPL A full implementation of the BCPL compiler language consisting of the language rom, disc containing the BCPL compiler, a screen editor, a 6502 assembler, other utilities and programming aids and examples of BCPL code and a 450 page manual. BCPL can be used to develop games programs, commercial packages, system software, to write control systems and to produce programs which otherwise would need to be written in assembler. £52(b)

BCPL STAND ALONE GENERATOR Utilities in this package enable the programs developed using the BCPL rom to be converted so that they can be run on any BBC micro whether it has a BCPL rom or not. Stand alone programs for other 6502 based systems can also be developed. £43(d)

BCPL CALCULATIONS PACKAGE: supplied on disc, it supports floating point, fixed point and fast integer calculations. It includes the BCPL calculation files, example files and a comprehensive user guide. £17.30(b)

ACORN LISP Rom £43(d)

ACORN FORTH Rom £43(d)

G:FORTH An advanced implementation of FORTH which follows the 79-Standard specification on a 16K ROM and has a full double number extension set. It incorporates an editor, 6502 assembler, very fast turtle graphics and supports extensive string and file handling. It contains 540 predefined words including those for reading joystick ports, produce sounds, set and read the time and produce random numbers. Fully compatible with disc or tape filing systems and works in any mode. Package comes complete with a USER GUIDE, Introduction to FORTH and 16K GFORTH ROM £43(d)

DISC DOCTOR Computer Concept's popular disc utility rom which adds 20 commands to the DFS system. £27(d)

EPROMs/RAMs

2764-25	£4.00(d)
27128-25	£7.50(d)
6264-15	£7.50(d)
6264LP-15	£8.00(d)

DISCMASTER Beebug's a disc utility which provides additional DFS commands and utilities including disc menu to automatically RUN/*RUN programs, converting 40 track discs to 80 track and enable dual catalog. £16(d)

EXMON II Updated version of the EXMON rom with facilities including dual screen operation and full screen memory editor. £24(d)

TOOLKIT This ROM adds 27 new commands to the BBC BASIC. These include a full screen editor, merge, relocating data in memory, program compactor, listing of variables and memory search. £23(d).

SLEUTH A debugging tool for BASIC programs which includes features like single stepping of dual screen programs, and accelerator to run programs from full speed to freeze frames. £24(d)

GRAPHICS ROM ,,★,, £27(d)

PRINTMASTER This ROM features the most versatile screen dump for EPSON MX/RX/FX80 and Kaga 810 printers. It supports three types of dumps. The first allows any graphics on the screen to be dumped. Colours appear as shades of grey. Any part of the screen can be printed at any position on the paper in any one of four orientations. The screen dump may be magnified by any factor x2, x3, x4 etc. A special feature allows true MODE 7 screen dumps with TELETEXT text & graphics. The second dump allows any text to be dumped whilst the third dump will print the contents of a file on disc whilst the computer is doing other things. This is not all. All printer functions can be called up using the *command. *DEFINE allows the printer to define his own characters and store them. *GPRINT allows printing of enlarged text in any position, orientation, size & shade. *WINDOW allows windows to be defined in any size and position on the screen. Can allow you to do printing as background operation while the computer does other jobs. **In short this one ROM does it all.** £28(d)

DUMPMASTER Disc based program that produces fast machine code routines for a variety of printers incl. EPSON MX/FX, STAR 910, Seikosha, NEC PC8023, INTEGREX 132A. Dumps in 8 shades in any mode including teletext mode. Snapshot facility allows dumps from games and other programs. £10(d)

MUROM Sound Extension Rom: Helps you create your own tunes and sound sequences either with MUROM's editor and a musical score or using the keyboard to simulate a piano. Edit your creations with the full screen music editor and then switch to envelope editor to tailor the tonal quality and select instrument type. Incorporate the music into other programs or playback with or without MUROM. Instant sound effects can be called from Basic eg *ZAP, *SIREN, *EXPLODE etc. £24(d)

BILLBOARD A useful program that enables your BBC to produce super-large 'Billboard' type characters i.e. a continuous horizontal scrolling of super-large characters. Supplied in ROM. £16.50(d).

HELP Rom based comprehensive on screen HELP facility to aid and speed up programming. £21(d)

MICROGUIDE Keyplate: This keyplate fits neatly over the keyboard and provides ready reference to a comprehensive list of VDU codes, wipe clean pen supplied, it can be used for fn. key identification etc. Spiral bound microguide book contains lots of useful information on keywords, abbreviations, *FX commands and error messages — saves hours thumbing through the manuals and guides. £6.50(d)

MICROTEXT This authoring system developed by the NPL allows production of a wide range of man-computer dialogues. User can draw up a frame made up of text/graphics and combine a series of frames to create modules which are incorporated into a program. An expert in any field can create complete courses of computer based instruction material. Applications include interviewing systems, teaching packages, training courses and interactive demonstrations and simulations. Disc £53(b) Cassette £43(b)

REPLICA II 40 & 80 Track Versions available. £10.35(d)

BROM — the new utility ROM from Clares — a Toolkit ROM that gives you full screen editing. Many extra functions are included. £30(d).

BEEGUG DESIGN £16.50(d)

BEEBUG SUPERPLOT Cass £8.50(d).

CP/M SOFTWARE FOR TORCH Z80 ACORN Z80 PROCESSOR

We can now supply almost any CP/M based software package in a format suitable for the Torch Z80 and Acorn Z80 second processors. The following are generally available from stock.

DBASE II £335(a) WORDSTAR PROFESSIONAL £380(a)

WORDSTAR £275(a) DBASE II Tutorial..... £32(c)

PROPASCAL £220(a) Supercalc 2 £200(c)

Phone for your specific requirements.

Please specify the type of format (TORCH or ACORN) required.

SPELLCHECK I Menu driven spelling checker for Wordwise or VIEW. Dictionary contains 6000 words and is expandable to 1700 on 100K disc. **£16.50(d)** Disc (80 or 40 Track) Specify whether Wordwise or VIEW.

MASTERFILE II The new version of the popular general purpose file management system. It allows large amounts of information to be stored and processed. It is extremely powerful yet flexible to use. The disc version allows up to 17 fields per record, and the only limitation as to the number of records is the capacity of the disc. Typically, using 5 fields, about 2000 records may be stored on a 100K disc. This latest version features many new facilities including use with WORDWISE/VIEW £16.50(d) Disc (80 or 40T).

HERSHEY CHARACTER font generator: Disc based menu driven package with 1500 new characters made up from 9 different Hershey character fonts. Flexible utility allows choosing of any characters and appending them to users programs. Screen dump routine for Epson printers included. £12.50(d).

When ordering software on disc plese specify track format (40/80)

BOOKS

(No VAT p&p £1.50 per book)

CPU/Assembly Language Books
6502 Applications.....£12.50
6502 Assy Lang Prog.....£17.50
6502 M/C for Beginners.....£ 5.95
6502 Advanced Programming.....£11.95
6502 Programming.....£13.95
6800 Prog Reference Manual.....£ 9.00
6809 Assy Lang Programming.....£13.45
6809 Programming.....£12.95
8086 Book.....£19.50
Prog. the 8086/89.....£13.50
68000 Assy Lang Prog.....£18.95

LANGUAGES
CP/M Handbook.....£13.95
Mastering the CP/M.....£16.50
FORTRAN Cookbook.....£ 8.00
Introduction to PASCAL.....£16.50
Prog the Micro with PASCAL.....£ 8.50
The UNIX Book.....£12.50

BBC Micro Books

Books for Beginners:
Let Your BBC Teach U to Prog.....£ 2.50
BASIC programming on the BBC — Cryer.....£ 5.50
BBC BASIC.....£ 5.50
BBC BASIC for Beginners.....£ 6.25
BBC Micro for Beginners.....£ 6.25
Easy Prog for the BBC Micro.....£ 5.00
Friendly Computer Book.....£ 3.50
Gateway to Computing BBC1.....£ 4.95
Gateway to Computing BBC2.....£ 4.95
Getting More from Your BBC & Electron.....£ 5.95
Introducing the BBC Micro.....£ 4.50
Step by Step Programming 1.....£ 5.95
Step by Step Programming 2.....£ 5.95

Languages/Programming
30 Hour BASIC.....£ 6.75
Advanced User Guide.....£12.50
Adv BASIC Rom User Guide.....£ 7.50
Advanced M/C Tech for BBC.....£ 7.50
Advanced Prog Tech for BBC.....£ 8.50
Assy. Lang. Prog. made easy.....£5.95
Assembly Lang Prog for BBC.....£ 7.95
Assembly Lang Prog 2nd Ed — Birnbaum.....£ 8.75
Applied Assembly Lang on BBC £ 7.95
BASIC Rom User Guide.....£ 9.95
BBC Rom Book B. Smith.....£9.95
BBC Micro Revealed.....£ 2.00
BCPL User Manual Acorn.....£15.00
Beyond BASIC BBC Publ.....£10.00
Creative Assembler on BBC.....£ 5.95
Century Computer Prog.....£ 9.95
Drawing your own BBC progs.....£6.95
Discovering BBC M/C.....£ 6.00
Guide to the BBC ROM.....£ 9.95
Expert Guide James.....£ 6.50
Exploiting BBC BASIC.....£ 6.95
FORTH Acorn.....£ 7.50
Further Programming for BBC.....£ 5.50
LISP Acorn.....£ 7.50
Programming the BBC.....£ 6.50
Structured Programming.....£ 6.50
S-PASCAL Acorn.....£ 7.50
Using BBC BASIC.....£10.00

SOUND & GRAPHICS:
Advanced Graphics with BBC.....£ 7.50
BBC Graphics & Sound.....£ 7.50
BBC Micro BASIC, Sound & Graphics.....£ 7.50
Creative Graphics Acorn.....£ 7.50
Graphics on the BBC Micro.....£ 6.00
Turtle Graphics.....£ 7.50

EDUCATIONAL:
35 Educational Programs.....£ 6.00
BBC Micro in Education.....£ 6.50
Prog for Education (Pri.Sch).....£ 5.95

DISC DRIVE SYSTEMS:
BBC Micro Disc Companion.....£ 7.95
Disc Book.....£ 3.50
Disc Programming Techniques.....£ 6.95
Disc Systems.....£ 6.95
Using Floppy Discs.....£ 6.95

APPLICATIONS:
BBC Filing Systems & Databases. £7.95
BBC Software Projects.....£ 6.95
Business Programming on BBC £ 7.95
Business Applications on BBC.....£ 7.95
DIY Robotics & Sensors.....£ 6.95
Essential Maths BBC/Electron.....£ 5.95
Exploring Music with BBC & Electron.....£ 9.95
Graphs & Charts Acorn.....£ 7.50
Interfacing Projects for BBC.....£ 6.95
Making Music on the BBC.....£ 5.50

GAMES:
21 Games for the BBC Micro.....£ 5.00
100 Programs for the BBC.....£ 6.00
Creating Adventure Programs.....£ 5.00
Instant Arcade Games.....£ 2.95
BBC User Guide Acorn.....£15.00

MISCELLANEOUS BOOKS:
6522 VIA Book.....£ 4.50
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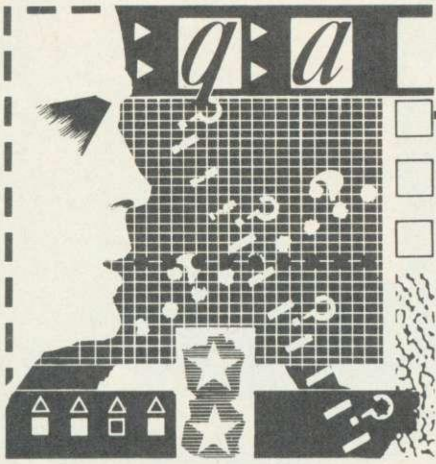
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How to run Beeb adventures on the Electron, DFS error messages and tracing cassette recorder faults – Martin Phillips helps you out

Adventures on the Electron

AN EXCELLENT tip for Electron owners has been sent in by Lorcan Mongey from Belfast. The Electron's mode 6 leaves 7k less memory than the BBC micro's mode 7 display. Having found that most Beeb adventure games are superior to those for the Electron because they have more available memory, Lorcan discovered a way of running some of them on the Electron.

Most of these games do not take up



It's easy to adapt Beeb adventures to run on the Electron

the full screen, so part of the screen memory area can be used for program storage. The technique is simple – part of the screen memory area is relocated as program space, and a small text window is defined at the bottom of the screen.

Listing 1 shows how this can be used with the Acornsoft *Sphinx Adventure*. The variable N% sets the number of lines available in the text window. The text window is defined with the VDU28 command and HIMEM is reset to point to the beginning of the text window. Page is also set to &B00 to gain some extra memory.

Before the program can be run, it's necessary to find and remove all MODE statements and replace them with CLS statements, to prevent the window and HIMEM being changed. You must also check whether the program uses any memory between &B00 and &E00 for variable storage. In the case of *Sphinx Adventure*, some memory at &C00 is occupied, and this can be altered to &A00. Once these changes have been made, the program can then be resaved.

This technique could have a wider application than our examples. By setting the text window to 8 lines, only 2.5k of memory is used instead of the normal 8k for mode 6. If a program gives the 'no room' message after a while, this indicates there is not enough room to store all the variables, and it will be necessary to reduce the window by a further couple of lines.

DFS error messages detailed

DISC drives have dropped considerably in price during the last year and many BBC micro owners are changing from cassette to disc. The disc filing system (DFS) generates its own series of error messages when it comes across a mistake, and on the whole, these are not well documented.

The messages generated by the DFS are given below, together with their error number.

Readers should be aware that if an error occurs while running a program and an error message not given here is generated, then it will be a program-generated message, not one generated by the DFS, and if the cause is not obvious it should be explained in the program notes.

Error	Error number	
Bad attribute	207	&CF
Bad command	254	&FE
Bad directory	206	&CE
Bad drive	205	&CD
Bad filename	204	&CC
Bad option	203	&CB
Can't extend	191	&BF
Catalogue full	190	&BE
Channel	222	&DE
Disc changed	200	&CB
Disc fault	199	&C7
Disc full	198	&C6
Disc read only	201	&C9
Drive fault	197	&C5
EOF	223	&DF
File exists	196	&C4
File locked	195	&C3
File not found	214	&D6
File open	194	&C2
File read only	193	&C1
Not enabled	189	&BD
Syntax	220	&DC
Too many files open	192	&C0

Drive fault and disc fault numbers

8	8	Clock error
10	A	Late DMA
12	C	ID CRC error
14	E	Data CRC error
16	10	Drive not ready
18	12	Write protect
20	14	Track 0 not found
22	16	Write fault
24	18	Sector not found

Bad attribute. This can only occur when using *ACCESS. When locking a file, this command expects the letter 'L', and any other letter will give this error.

Bad command. This is the DFS equivalent of the 'Mistake' error message in Basic, eg, typing *COT instead of *CAT will generate it. The DFS, not recognising it as one of its filing system commands, will first assume that it is expected to *RUN a file called COT and so looks for it on the disc, and the error message is only given when it fails to find a file called COT there.

Bad directory. This message is only generated when trying to change directory. Any single character except ':' can be used, but if more than one character is used, then this error message is generated. Incidentally, if the colon is used with *DIR, the DFS will give the 'Bad drive' error!

It's not necessary to change the directory before loading or saving a program. This can be included in the filename, eg, to save a program called JUNK in directory W, the following syntax is used:

IF YOU have a technical hitch or a programming problem let Martin Phillips give his diagnosis. We'll pay £5 if you raise a really interesting point. Please give full details of the system you're using and include a listing where appropriate, making your question as specific as possible. WRITE TO: Hints & Tips, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

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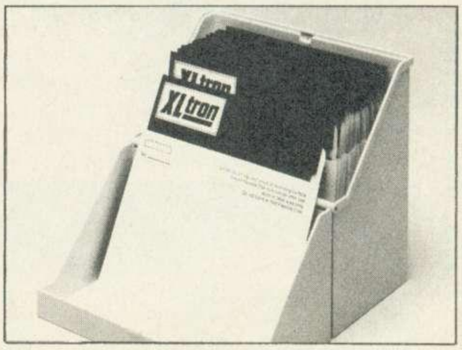
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SAVE "W.JUNK"

Similarly, the drive number can be included in the filename:

SAVE ":1.JUNK"

Note that the colon precedes the drive number. Both the drive number and the directory can be included together:

SAVE ":1.W.JUNK"

Using this syntax will not change the drive or the directory, and these will remain as they were before the program was saved.

Bad drive. Any command that tries to change the drive can give this error message, if the drive specified is not in the range 0–3; eg, the error will occur if one is loading a program called JUNK from drive 1 using the syntax above, and the LOAD command is mistyped:

LOAD ":!.JUNK"

No error will be generated if, say, drive 3 is selected but there is no drive 3 connected to the computer. The micro will simply hang up.

Bad filename. The filename entered is illegal for some reason. The most common error is to put a filename of more than seven letters.

Bad option. This error occurs with the *OPT command. The only acceptable parameters are:

*OPT4,0	off
*OPT4,1	*LOAD a !BOOT file
*OPT4,2	*RUN a !BOOT file
*OPT4,3	*EXEC a !BOOT file

Can't extend. The dreaded 'Can't extend' error only occurs when saving data files, as opposed to programs. If a data file is loaded from disc, and then extended and resaved, the DFS will try to put the file back in the same place it found it. Now if another file has been saved on the disc after the first file was initially saved, there will not be room to squeeze the extended file back into the original space and the error will be generated. This is an annoying error, as it will corrupt the disc version of the extended file (but not, of course, the version in the computer's memory). The cure is to delete the file from disc first and resave it, then the DFS will find a new space to put the file. Alternatively, save the file under a different filename.

Catalogue full. At the start of a disc its contents are catalogued. This catalogue also tells the filing system where the file is to be found on the disc, and how long it is. On the Acorn DFS it is possible to have only 31 catalogue entries, irrespective of how short each file is. This message will occur if one tries to save more than 31 files on any disc. Some alternative DFSs will allow more than 31 files.

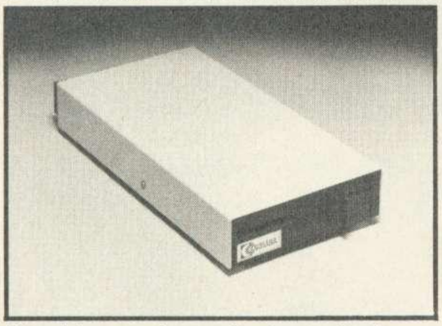
Channel. This error message means that one has attempted to read or write to a file that was not opened first. The error is generated when an attempt is made to read or write to this non-existent file, but is not if this non-existent file is just opened.

Disc changed. One has to try really hard to get this error. It can only be done by opening up a file, changing the disc, and then attempting to read or write from it.

Disc fault. The full syntax of this error is:

Disc fault <number> at <track> <sector>

Whatever the fault number, this error is bad news. The actual fault number is rather academic as far as the user is



Disc drives are increasing in popularity

concerned – they all mean that the disc drive is unable to read the necessary part of the disc. This is almost always a 'fatal' error, and nothing can be done to recover the data.

This could happen for several reasons. The disc might have been damaged in some way and one or more sectors been made unreadable – possibly by bad handling or storage of the disc, or it being corrupted by a faulty disc drive. (For instance some makes of drive will corrupt a disc if the power is switched on or off with a disc still in the machine.)

Other reasons might be that a 40 track drive is trying to read an 80 track disc, or vice-versa; the disc has not been formatted; or that the disc has not centred properly in the disc drive.

Usually the latter is accompanied by odd noises from the drive itself. I find this is a common problem when formatting new discs on half-height 80 track drives. (The otherwise excellent double-sided 80 track Mitsubishi disc drive that Acorn and Cumana use in their 800k drives is particularly prone to this problem.) Often they do not centre properly, and then they are formatted off-centre. When the disc is removed and later replaced, it appears to be unformatted. This only seems to happen with brand new discs, and some makes are more prone to the problem than others. A careful examination of the back of the disc hub will often reveal tell-tale off-centred marks. The cure is tiresome but easy – *CAT the new disc first, then remove it from the drive, replace it and format it. It is probably caused by the new disc not moving freely in its sleeve, and spinning it round a few times releases it.

The Watford DFS does not give a fault number here, but generates a slightly more sensible error message such as SECTOR not found at... The error number is the same however.

If a disc drive gives this error message frequently with a variety of discs, it suggests that the fault could lie in the disc drive itself (very bad news).

Disc full. Time to buy some new discs! If the disc has had files on it which have been deleted, then there could well be some space available – *COMPACT will free it. Don't *COMPACT a disc with a program to be saved still in the computer's memory, as it will destroy this program. It's worth having a blank formatted 'emergency disc' so that the program can first be saved to it, the full disc is compacted, and the program is copied to the emergency disc.

Disc read only. This is an error message that is soon learned – it means that the write protect notch at the side of the disc has been covered up to prevent accidental erasure of any files. The error will only occur if an attempt is made to write to the disc (save another program or data on it).

Drive fault. First check that the disc drive cable is plugged into the computer. If this error occurs frequently, it suggests that the disc drive is in need of repair or re-alignment – a job for the experts.

EOF. EOF stands for end of file, and means that the program has tried to read beyond the end of a data file.

File exists. This only occurs with *RENAME, when one tries to rename a file using a filename that is already present on the disc.

File locked. Again another common error. An attempt has been made to save a file which already exists on disc and has been locked. If the file has not been locked, saving a file with the same name will overwrite it.

File not found. The cause is not always as obvious as one might think. Apart from the file not being present on the disc, this is often caused by a typing mistake, or an incorrect drive number or directory.

File open. An attempt has been made to open a file which was already open. This can be cured by closing all the files using CLOSE #0. If other files are in use at the same time, then closing them all can generate the 'Channel' error message.

File read only. This message will only be generated if Basic 2 is present, and occurs if an attempt is made to read a

file using PRINT# when the file was opened for input transfers using OPENIN.

Not enabled. If an attempt is made to *BACKUP a disc, or *DESTROY all the files without enabling the command first, then the DFS will give this message. *ENABLE is just a failsafe to make you think first before destroying the contents of a disc. This message does not appear with the Acorn 1.2 DFS or DNFS.

Syntax. If the DFS recognises a command, but its argument is incorrect, then the DFS will print out the correct syntax. For example, typing *DUMP will give the following syntax message:

Syntax: *DUMP <fsp>

Too many files open. It is only possible to open five files at once on the Acorn DFS – any attempt to open more will result in this error.

Double trouble

G SEXTON from Essex has been trying without success to input text in double height lettering using mode 7 – a problem first highlighted back in January 1984's 'Hints and Tips'.

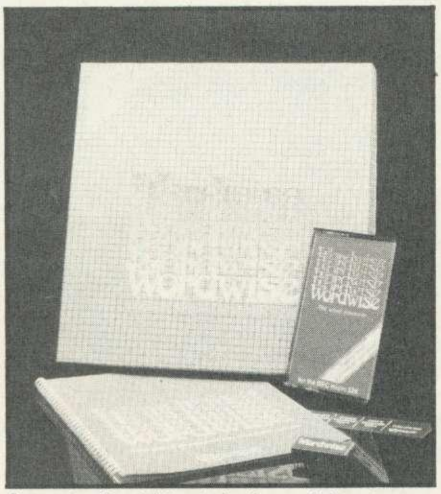
It's not possible to have double height lettering with the input statement, and the simplest way to achieve the desired effect is to use the GET statement. This does not print the letter on the screen, so after a letter has been input, it can then be printed in double height. This is repeated until the GET statement detects that the Return key has been pressed.

Two versions are presented here (listings 2 and 3), and both could be written as procedures, then included in a procedure library. The longer version has a double height print procedure which could then also be utilised by the rest of the program.

Minus point to Wordwise Plus

I HAVE always thought there was something not quite right about the part of *Wordwise* that deals with embedded commands, especially when one tries to define headings and footings. Sometimes strange things happen, or more to the point, things don't happen.

It appears that the problem has not been improved with *Wordwise Plus*. I put in a T15 as an embedded command, then imput a OC27,70 (end emphasised print). The end emphasised print did not work. However if I put that first, it did! I tried reversing them again, and the same thing happened, which I cannot explain.



Some faults of *Wordwise* haven't been rectified in *Wordwise Plus*

This is rather a pity as *Wordwise Plus* is a great improvement over *Wordwise* in other respects.

Off the recorder

CASSETTE recorder trouble is Mr Bhamra from Bombay in India's problem. His will not load or save any programs and he would like help in finding the fault. There are many possible causes for a cassette not working, some of which are very simple to put right, while others are a job for the dealer. However there are several easy things to try before taking the computer and cassette in for repair.

My first piece of advice to all computer users with cassettes is to purchase a spare cassette lead (and an RGB or video lead while you're at it). Having bought an expensive piece of equipment it's only sensible to pay a little extra for a few essential spares. Changing the cassette lead is the easiest way to see if that is the cause of the problem. An inspection of the soldered joints in the plugs does not always reveal the fault as sometimes there is a break in a conductor part way along the lead, which is difficult to find without a test meter, or a bulb and battery. Obviously the life of the cassette lead will be greatly extended if the computer system is not moved or unplugged.

If the fault does not lie in the lead, then test the cassette itself. First determine whether it is the load or save facility, or both, which is at fault. This can be done by first using a prerecorded tape and trying to load that. If it loads correctly, try saving a short program and listening to the tape after it has been saved. (This is not possible on the new Acorn data cassette with the separate power supply as it has no speaker; one should play the tape back on another machine.) One should hear the tone. Then, if possible, try the cassette on another computer and vice-versa. This will show which is at fault.

The most common fault in the computer I have come across, is that the LM324 chip fails. The LM324 is the interface chip for the cassette port, and is situated near the cassette socket on the main circuit board. Usually it is the input part of the chip which is affected. This can be changed oneself if one has a good set of tools, a steady hand and some experience of soldering. Do not try unsoldering all the pins at once, cut the IC out first, using a good pair of fine side-cutting pliers, and then unsolder each leg in turn, taking care not to damage the plated-through holes. When fitting a new chip use an IC socket.

My advice, having said that, is to pay the dealer and let him change the IC if necessary as this is not a job for the amateur, as the chip is in a position on the board which makes it difficult to get at. A few Beebs were built with this chip already fitted into a socket, making replacement of the chip easy.

Faults with the tape recorder itself were dealt with in July 1984.

Quickfire questions

WHEN SAVING test files to try out a database or a new wordprocessor, I give them the filename JUNK. Then later when I have a disc-tidying session I can see which are the files I want and which I can safely delete.

WORDWISE PLUS seems to have no positive way of clearing text. A simple way to achieve this is to preview the text and then press Break. This should serve as a warning too!

I CAN never remember which edition of *Acorn User* a useful program or article is in. Sometimes the contents page helps, but not always. Instead I stick a plain label inside the front cover, and make a note on it of any useful items I find.

IF YOU forget the order in which the four numbers of the text and graphics windows are defined, try thinking of them this way. Put the bottom-left co-ordinates of the window first, and then the top-right co-ordinates. Put the x co-ordinate first in each case. This is in fact a quite logical order.

Hints and tips listings 1-3 are on yellow page 97

ENTER-TAINMENT

Having trouble typing in listings? Tessie Revivis pinpoints possible pitfalls and suggests solutions

ENTERING program listings is fraught with pitfalls. We admit it – but being aware of the fact we make strenuous efforts to ensure that all of our program listings are correct, and that the grovelling apologies in the next issue's Blunderbox are kept to an absolute minimum!

All listings that appear in the yellow pages are re-dumped from the working copies used to provide masters for the production of the monthly cassette and bar code listings booklet.

So how should you go about entering a program listing from the yellow pages, and get it running correctly?

This may sound quite obvious, but first read the article, study the 'program notes' that are often found with the article itself or accompany the listing, and look at them again if it all seems a little vague. You would be surprised just how many people phone the already overworked Editor and Technical Editor complaining that 'the program listing on page xyz is wrong', and then admit that they haven't even read how to use it correctly! Once you've read these items, you're ready to tackle the keyboard itself.

Locate the listing in the yellow pages, then look at the first few lines. You'll notice that these contain REM statements which look like this:

```
10 REM Tax Evasion Program
20 REM by O.N. Le Fiddle
30 REM for BBC and Electron
40 REM (c) Olivetti User May 1985
```

They tell you the name of the program, its author (or authoress), what micro it will run on, the copyright and date. Line 30 is important and you should always have a look to ensure that it will work on your micro. It might, for instance, read:

30 REM for Electron-Plus 1 only

This would tell you that only Electron-owners with Plus 1s will be able to use the program. You'd be surprised at the number of people who complain that 'There's nothing in the issue for the Electron' – just look and see!

Having ascertained that the program will run on your micro, refer back to any notes on entering the program to see if there are any special requirements. For example, does PAGE have to be set to any particular value? Does any Econet have to be disabled? If PAGE does need to be reset, then do it now.

Now comes the task of typing in the program itself. To make things as simple as possible we try to ensure that all program listings are presented with line numbers starting at 10 and then incremented in steps of 10. BBC Basic contains a facility that allows you to let it number the lines for you, so all you have to do is add the line content – the command is AUTO. Just type this in (then press the Return key) and the first line number, number 10, will be presented on the screen thus:

AUTO <return>
10 _

The flashing cursor will be positioned a space away from the line number itself. This 'spacing' is purely for readability – it will not be entered into the program, so don't be concerned if there is or is not a space in the program listing between line number and start of the program on that line. Enter the first program line, press the Return key at the end, and the next line number will appear on the screen – just keep repeating this procedure until you have entered all the program lines.

During the course of entering the listing you might encounter a few problems, so let's examine what these could be and how to circumvent them.

The lines that begin with a REM, eg:

200 REM main program starts here

are for information only, and are not vital for the program to operate correctly. If you don't fancy typing them in (after all you're probably not a typist), then don't bother. However, do enter just the REM part so that your line numbering does not get out of sequence. For example, for line 200 above enter:

200 REM

If at any time you make a typing mistake, finish entering that line, press Return and then hit the Escape key. This will stop the generation of the line numbers and allow you to edit the line as required – or you could simply re-type the entire line again. To re-start the automatic line numbering, type AUTO and follow it with the next line number you want (figure 1).

Occasionally line numbers may deviate from the steps of 10 sequence. In these instances you have two options. First, leave the automatic number process by pressing Escape as described above, or enter all the lines in steps of 10 and come back to these 'odd' lines at the end.

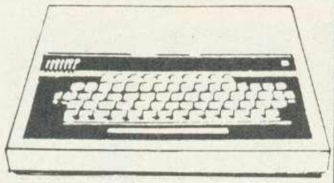
Once the listing has been entered, SAVE it! It's possible, especially with machine code listings, that if you Run the program and it does contain a bug, it will corrupt itself and be lost forever. So SAVE comes before RUN for the preservation of your sanity.

Actually, with very long listings it's good programming practice to save what you are typing in at regular intervals to safeguard yourself from power cuts, fuses blowing and other annoying acts of fate. There's no strict rule as to how often, but certainly after every five minutes or so of typing. You could use the automatic program saver printed in the November '84 *Acorn User* (p.99) which will save the current program

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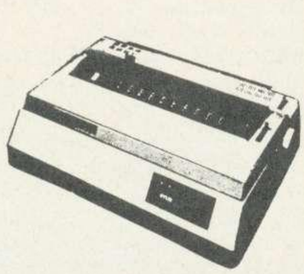
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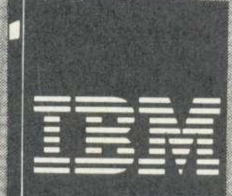


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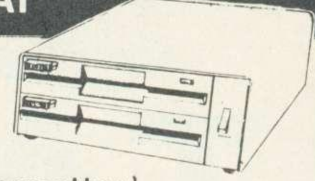
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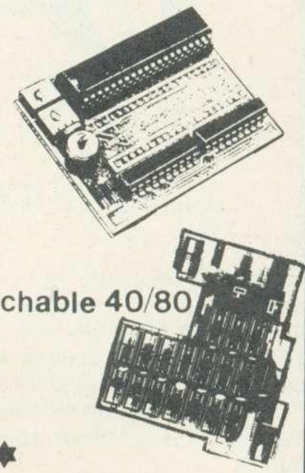
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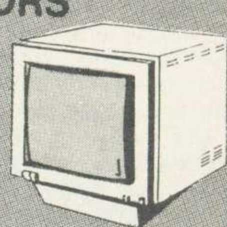
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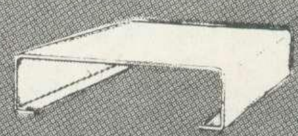
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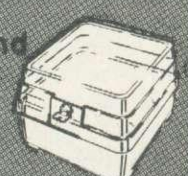


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every four minutes as you type it in.

Now that the listing has been entered and saved we come to the debugging process. First look down the program you have entered to find any lines that contain the ON ERROR statement, eg:

70 ON ERROR RUN

If you see any of these, delete them from the text – the program notes will normally give the line numbers in which they occur. If such a line was left in a program that contained an error it would simply be re-run, and re-run, and re-run and ... you get the idea. We would never know what the error was, because the program gets re-run whenever it occurs – Catch 22.

Run the program. At some stage of its operation, perhaps straight away or after a little use, it's likely that you will get an error message of some sort. Likely, because it is almost impossible for anyone, including all the regular *AU* authors, to enter (or write) a program that will run correctly first time. It is certain to contain a mistake or two that will lead to an error message being generated. A common error message is:

Syntax error at line 1234

The error message displays the line number which is confusing the micro. Syntax error means that there is a spelling mistake within the line. Typical examples include the mixing up of 1,0 and I,O. Pound signs are very rarely needed in listings, except those of a financial nature. If you see a pound sign then query this as it is probably meant to be a hash, "#" character – especially in assembler listings. This occurs because printers are set to American fonts rather than British ones.

Another common error is:

No such variable at line 999

Here the computer has come across a variable that it does not recognise. In this instance, look at the line concerned to find if it has been entered correctly, and do the variable names tally with those printed in the listing? If they do then the problem lies elsewhere in the program, where the variable in question has probably been misspelt.

When you want to check through a listing, you will find it advantageous to list the program as it appears in the magazine. To do this you need to enter the following two commands:

LIST01
WIDTH 40

LIST01 ensures that a space is 'printed' between the line number and the start of the line. WIDTH 40 sets the length of the line to 40 characters. If you own or have access to a printer you could obtain a hard copy, otherwise you'll need to list the program on the screen.

The best way to do this is to enter paged mode by pressing the CTRL and N keys together. If you now type LIST, the program will list until the screen 'page' is full, then stop. The next page of screen listing can be obtained by pressing the Shift key. To get out of paged mode, type CTRL and the O key.

Rather than going straight for a character-by-character check of the program, first look down the right-hand side of the listing to compare the end characters with those in the yellow page listing. If they tally then you have not typed in an extra character or omitted one: many errors can easily be caught in this way. Taking this technique a step further, use a ruler to run down a column of characters somewhere in the middle of the listing and compare these.

If these operations don't get rid of all the bugs, then some hard checking is needed. If you can get someone else to compare the listings this is not only much easier on you but also a good move, because you are often 'blind' to your own mistakes, passing over them each time you read through the listing.

If the program is still not working at this stage, what do you do? One answer is to purchase our monthly cassette, and in many respects, if you are having trouble debugging a particular program it is a worthwhile investment (at least once) because you can compare our program with yours and find out where you are going wrong.

If you have reached this stage then the error is almost certainly a well hidden one. What you must try to do is ascertain where it is occuring and why. The error message will often give much of this information, so refer to the back of the User Guide for details of the error message itself. Often, though, the error can be happening in a different part of the program. For example, the error message:

No such FN/PROC at line 90

would suggest that a mistake is occuring in line 90. On listing line 90 you see that it reads:

90 PROCmenu

All above board. In this instance the error almost certainly lies in the line of Basic that defines the PROC in question. Looking through the program for:

DEF PROCmenu

we might come across it as:

500 DEF PROCmanu

A spelling mistake has occured. Line 90 could not find PROCmenu because it had been spelt PROCmanu.

Loops are another culprit. For example, you might have accidentally used a loop variable in another part of a program which causes the loop to execute for ever. For example:

```
10 FOR N% = 0 TO 10
20 PROCcheck
30 NEXT N%
40 END
50 DEF PROCcheck
60 IF N% > 0 THEN N% = 0
70 ENDPROC
```

would never complete, as N% is reset to 0 every time. In cases like this printing the values of variables can prove most informative. Adding a temporary line such as:

15 PRINT N%;

would show this type of error up immediately, as would the Basic debugging command, TRACE.

Typing TRACE ON, before running a program, will cause each line number to be printed as it is executed. The above example of a loop would show up straight away, as the lines associated with the loop and PROC would be continually displayed on the screen (or printer if activated). The command is switched off with TRACE OFF.

If all this fails then perhaps a blunder has occured. If the listing is in a past issue look in the issues for the following few months to check for corrections on the Noticeboard page. If not, and you have access to Micronet 800, look at the *Acorn User* pages there.

Finally, if you do find a blunder please tell us so that we can correct it.

With these thoughts under your belt have a go at entering a good *Acorn User* listing. I suggest the Bulletin Board by Jeff Tullin on page 87, as this contains both Basic and machine code, and program notes are also provided.

```
   210 FOR N%=0 TO 100  - correct line
   220 PTINT N%         - PRINT mis-spelt
   230                  - next line number press ESCAPE key
Escape                  - Escape message printed
>                       - return to prompt
>220 PRINT N%           - correct line entered
>AUTO 230               - re-enter AUTO at line 230
   230 _                - line 230 generated
```

Figure 1. Re-starting automatic line numbering

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Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford Electronic's new book entitled 'MYSTERIES of DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on the discs.

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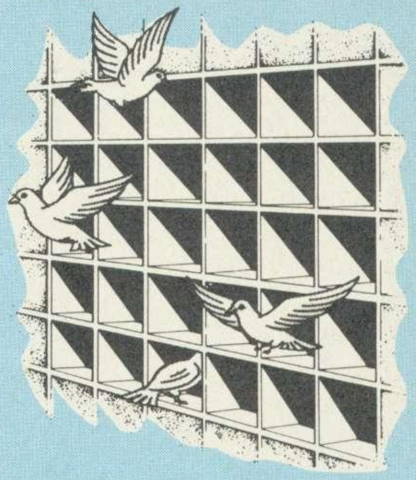
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Watford Electronics supply two highly sophisticated Disc Filing Systems specially designed to be fully entry point compatible with Acorn's standard DFS. As well as this, these two DFSs provide significant and powerful enhancements to allow the user greater ease in acomplishing a given task.

Many people who are about to buy a DFS find themselves wondering which one to opt for: should they buy the standard Acorn one and restrict their available features, or should they buy one of the other DFSs and find themselves running into compatibility problems if they opt for the wrong one? Before you look below to see the vast range of extra features that our DFSs provide, may we just point out that our DFSs are fully Acorn compatible; not just partially, like some of the "competition". We have been supplying DFSs for two years now with many thousands of satisfied users. Also, please note that the Watford DFS is supplied by a reputable firm via proper mail order and shop premises.

Just compare the features:

Features	Acorn 1.20	Watford Single Density	Watford Double Density
Max nos. of files per disc side	31	62	62
Max disc capacity	800k	800k	1440k
Tube compatible	Yes	Yes	Yes
Built-in Editor	No	Yes	Yes
Built-in Formatter	No	Yes	Yes
Built-in Verifier	No	Yes	Yes
MRUN a file	No	Yes	Yes
MLOAD a file	No	Yes	Yes
Extended RENAME	No	Yes	Yes
Selective COPY	No	Yes	Yes
Default file name	No	Yes	Yes
Disc space distribution	No	Yes	Yes
40/80 Software Switchable	No	Yes	Yes
Wide catalogue	No	Yes	Yes
Close open files	No	Yes	Yes
Improved OPENOUT	No	Yes	Yes
Copy between densities	N/A	N/A	Yes
OSWORD &7F	Yes	Yes	Yes
Full entry point compatibility	Yes	Yes	Yes
Retain information over a break	1.20 partial	1.42 Yes	1.52 Yes
Games compatibility	Yes	Yes	Most
Econet file server	Yes	Yes	Yes
Econet station	Yes	Yes	Yes
Full wildcard facilities	No	Yes	Yes

Note that whilst BOTH of our DFSs are compatible with the 6502 and Z80 Second Processors, the Acorn DNFS ROM (supplied by Acorn with the processors) should be present within the machine for the Tube transfer protocol. Our single density DFS is compatible with the Torch Z80 system. With the current versions of our DFS and DDFS, "PAGE" will remain unaltered by the presence of a DNFS ROM; i.e. the normal value of &1900 is retained.

THE WATFORD DFSs

Designed to offer power and flexibility, the two versions of our DFS are packed with features such as:

- *Acorn's slightly antiquated DFS allows a maximum of only 31 files per side of a disc. OUR DFSs cater for either 31 or 62 files per side of a disc. In 62 catalogue mode, all these files are available and displayed as one continuous catalogue; not a collection of small catalogues that require extra effort on the part of the user to swap between. We have found that 62 files is adequate in normal use (more would require altering "PAGE", which is undesirable – again this is due to the way in which the BBC micro is organised).*
- *Built into each Watford DFSs are the disc Formatter, Verifier and Sector Editor that are so useful and essential for the operation of a DFS. We do not ask you to pay extra for these features with our DFSs – they should always be present within a perfect DFS and therefore included in the price.*
- *One of the excellent features of the BBC is its 80 column mode of operation. Acorn's DFS, unfortunately, only displays in 40 columns even in these 80 column modes; ours displays the catalogue correctly in 4 columns. This feature has now been extended to include the 80 column display of the filing system information at the top of the catalogue as well.*
- *When working on a program, most "load and save" operations to the disc will use the same filename (ie that of the current program). To save typing, and minimise errors, our DFS has a novel feature whereby a "default" filename can be entered. Once this is done, the usage of a null filename will cause this previously entered filename to be used.*
- *Catalogues produced on the screen by our "Ultimate" DFS include extra information to say how many files are present within the catalogue, whether the catalogue is 31 or 62 files in size, how many tracks are on the disc, and whether the double stepping mode is active, etc.*
- *Due to the way that Acorn decided files should be stored, there is occasionally a need to "compact" the available spaces on the disc. As this can alter the contents of memory, we decided that it would be useful to implement a command that informs the user whether compaction is necessary, and if it will actually result in any significant gains.*
- *One standard requirement of a filing system is to be able to rename files. Acorn's simple DFS only allows for one named file to be changed to another named file. Our "Ultimate" DFS allows for groups of files to be renamed. For instance:*

  RENAME *BERT* *FRED

  will take all the files that have BERT in their name, and change the BERT to FRED.
- *The OPENOUT command on both versions of the Watford DFS has been improved so that it automatically selects the largest available space on the disc; thus minimising the frequency of the Can't extend error messages.*
- *Both of our DFSs feature, as standard, the ability to make a normal 80 track disc drive read and write 40 track discs. This is normally accomplished by an expensive manual switching unit on the drives; our DFS does this as standard.*
- *The software switching aspect of our DFS and DDFS is far more flexible than a standard switchable drive. The reason for this is quite simple: a switchable drive means that both sides of the disc are either 40 OR 80; you cannot have 40 track on one side and 80 track on the other side with a standard switchable disc drive. The Watford DFSs are fully independent, and thus far more powerful. With the DDFS, both the density and the 40/80 aspect are independent; thus offering incredible flexibility.*

There are many other features of the Watford DFS too numerous to mention, but all well documented in the excellent DFS manual sold separately.

WATFORD's SINGLE DENSITY DFS

This popular and widely acclaimed DFS has now been available for two years, and has gained a large following amongst serious users of the BBC Micro. Owners of Acorn's standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for the price of this upgrade.

PRICES

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- *DFS Manual (Comprehensive)* (no VAT) **£6.95**

(P.S. Our comprehensive DFS Manual covers both Acorn & Watford DFSs)

- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£14**
- *Watford's DFS is exclusively available from Watford Electronics. Every ROM carries a special label with our LOGO and serial number.*

WATFORD's DOUBLE DENSITY DFS

The DDFS from Watford Electronics represents a new standard in DFSs for the BBC micro. This is a double density version of our popular single density DFS, and combines all the features of this powerful DFS with the advantages of a system that gives 80% more storage per disc in double density mode. P.S. – Please note that not all DDFSs are capable of providing either the full 80% storage increase, or of allowing a file the full size of the disc – Ours allows both of these!

The Watford Electronics DDFS will operate with discs formatted in either single or double density: the density is automatically sensed on an access to the disc and this is then remembered for future accesses. The built-in formatter prompts for the density when a disc is formatted, allowing the user to select the density of his own discs.

The typical piece of games software these days is provided upon a protected disc. In order to work on any double density system (including the others on the market) a protected piece of software needs to make calls through the OSWORD &7F routines. To ensure compatibility, the Watford DDFS features probably the most comprehensive and powerful 8271 emulation ever written for a double density system.

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- *Complete DDFS Kit incl. fitting instructions* **£85**
- *DDFS Manual* (no VAT) **£6.95**
- *We will exchange your existing Single Density for our DDFS Unit at* **£40**

Quality Disc Drives from Watford Electronics

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates the single density capacity. The double density storage capacity is second one, (that within the brackets). All disc Drive type numbers start with the prefix "C".

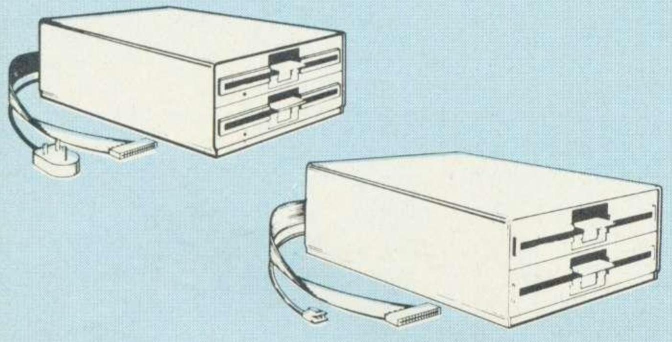
The tinting on some of the boxes is used to indicate which Drives are 40 track and which are 80 track. The 40 track ones are manufactured by EPSON, the world famous Japanese company, (non-tinted boxes). The 80 track drives are famous MITSUBISHI drives (tinted boxes).

With two prices in a box (e.g. £295/£299), the first price is for the standard drive and the second for the same unit in switchable type. Users of either of the two Watford DFSs will not need switchable drives as their DFS will provide software switching for them. Users of Acorn's DFS will find that they need to pay the extra for switchable drives if they wish to use 40 track discs in an 80 track drive.

Both the EPSON and MITSUBISHI drives that we supply are fast (3ms track to track, 15ms settle), quiet and have a low power consumption (average well under 1 amp). Extensive experience of the usage of disc drives suggests that the MITSUBISHI and EPSON drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro. Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high quality Epson and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

Names you can trust, at prices you can afford!

If you look around the popular BBC micro press, you will find that the prices we quote are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal. STOP PRESSS – SEE LATER FOR AN EVEN BETTER DEAL.
Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate: extensive tsts within our workshops have confirmed this.
All disc drives advertised here will operate in double density mode with the appropriate interface and software.



Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
100K (180K)	CLS100 £85		CS100 £119	
200K (360K)	CLS 200 £89	CLD200 £165	CS 200 £129	CD200 £194
400K (720K)	CLS 400 £120 / £130 CLS400S	CLD 400 £175	£145 CS 400S	CD400 £200
800K (1.44M)		CLD800 £235 / £265 CLD 800S		£285 CD 800S

Prefix C = Cased Drive
L = Less PSU
S = Single
D = Double

Suffix S 40/80 Switchable

e.g. CLS400S = Cased drive, Less power supply unit, Single 400K, Switchable (40/80 track).

FREE FREE FREE FREE

As an added bonus to customers of Watford Electronics who purchase disc drives from us, we are now including a special utilities disc ABSOLUTELY FREE!

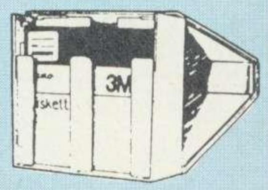
This disc contains a disc formatter and verifier (especially for those who own the Acorn DFS), Watford's popular "Centipede" like game called CRAWLER, a fascinating graphics program, a disc/high score data base index program and a special utility for "REMOVING" by software, ROMs from a machine; this feature is operative over a Break, providing that the workspace is not corrupted.

3M – 5¼" DISKETTES

Top quality 3M – SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All our discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick disc labels and write protect tabs.

FREE FREE FREE FREE FREE

Watford Electronics are now the biggest single distributor of 3M's 5¼" floppy discs throughout the UK. As a gesture of thanks, we are this month giving away absolutely FREE this Disc library case with every box of 10 discs purchased from us. (Offer valid until stocks last!)



DON'T SETTLE FOR LESS, BUY THE BEST

- *10 × S/S D/D 40 Track Diskettes* **£13**
- *10 × D/S D/D 40 Track Diskettes* **£18**
- *10 × S/S D/D 80 Track Diskettes* **£22**
- *10 × D/S D/D 80 Track Diskettes* **£24**

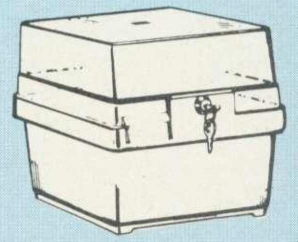
DISC ALBUMS

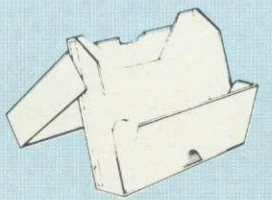
Attractively finished in beige leather-look vinyl, these conveniently store upto 20 Discs. Each Disc can easily be seen through the clear view pockets.

£4.25

LOCKABLE DISC STORAGE UNITS

Strong plastic case that afford real protection to your discs. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.





PLASTIC LIBRARY CASES

FOR 5¼" DISC STORAGE holds 10 Discs. **£1.80**

FLOPPY HEAD CLEANER KIT

The heads in floppy disc drives are precision made and very sensitive to dirt. Drive manufacturers recommend that you clean the heads approximately once a week. Unless your home or office is dust free, one of these Kits is a very sensible precaution against losing valuable data. A dirty head can destroy many discs before you realise the trouble. Very simple to use.

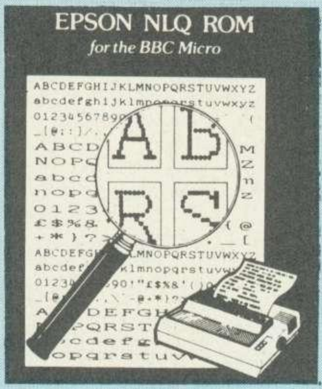
£9

DUST COVERS

(For our Disc Drives)

Single (without PSU) **£3.20** Twin (without PSU) **£3.85**
Single (with PSU) **£3.25** Twin (with PSU) **£3.90**

Continued →



Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ! (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:

- Simply type *NLQ80/100 and a single VDU code to use NLQ print.
- NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
- Single codes select PROPORTIONAL type (yes even on the RX80); ENLARGED type; UNDERLINED type. These features can be used seperately or in any combination.
- Full UK character set; Standard 'pica size'; Proportional spacing; Enlarged; Underlined; Normal type.

The NLQ ROM is supplied complete with comprehensive manual.

P.S. NLQ ROM is compatible with the Torch Z80 system and can be used from within the Perfect Writer software.

Only: £22

VIEW PRINTER DRIVER for NLQ ROM

This specially written printer driver has been designed to allow View access to the full features of our NLQ ROM.
A must for all VIEW and NLQ ROM users.

£7.00

NEW LAUNCH

THE NLQ DESIGNER

The Kaga Taxan KP810 and KP910 are two superb printers, as our many thousands of satisfied customers would surely attest to. One of it's particularly strong points is the NLQ option that it offers; perhaps one of the more weaker points is the effort required to design your own custom NLQ font.

Well the solution is here NOW in the shape of Watford's NLQ DESIGNER ROM! This powerful piece of software allows easy design and entry of a full NLQ font, with further fonts recallable from disc. Once a font has been programmed with the versatile NLQ DESIGNER, it can be saved to disc, downloaded to your Kaga (or Canon) printer, or even programmed into an EPROM (given the appropriate hardware) and then plugged directly into your pronter so that it is available immediately when you turn it on.

A 40/80 track format disc containing plenty of example fonts, etc. is also included in the package.

(P.S. This ROM is not suitable for Epson printers as they don't normally have NLQ ability. Keep reading our adverts though – work is in development!)

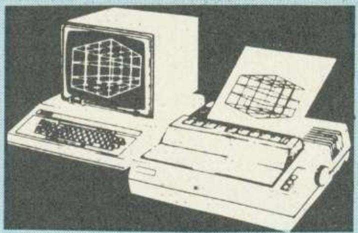
SPECIAL INTRODUCTORY PRICES

NLQ DESIGNER & FONT DISC **£25**

INDIVIDUAL Preprogrammed FONT ROMS **£15**

(Please write in for further details on both the NLQ DESIGNER and the individual font ROMs available.)

DUMPOUT 3



A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!
The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.
Two commands are used to operate the dump routines:
*GIMAGE – This provides a full graphics dump of any graphics mode, plus modes 7 and '8'. There are many optional parameters but you need only specify the parameters you wish to change.

Features available include:

- Vertical and horizontal scaling through all the graphic modes and mode 7
- Rotation of the image produced through 90, 180 and 270 degrees
- Left hand indentation setting
- Screen dump window definition
- Colour grey scaling
- Two tone fast dump
- Special colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered dumps
- User port switched dumps

What does the independent press say!

Practical Electronics, May 1985
"The Dump Out 3 ROM from Watford Electronics represents one of the most sophisticated types of printer dump utilities available for the BBC Micro . . .".

"an extremely sophisticated and powerful dump utility".

"VERDICT – Dump Out 3 ROM has all the facilities which you are ever likely to need for producing printer dumps. The facilities available work extremely well and if printer dumps are something which you require, then this ROM can be recommended to help you to get the best out of your dot matrix printer".

The Micro User Feb. 1985.
"Well, here is that winner"!

"provide(s) some rather sophisticated screen dumps. Producing high resolution paper copies of graphic screens in any (graphics) mode will be the major reason for buying this ROM, and this is where Dump Out 3 performs PAR EXCELLENCE". (Our capitals for their italics.)

"The versatility of *GIMAGE (the graphics dump command) when using these parameters is amazing. Pictures of almost any size, shape, contrast or distortion may be produced without the need for a reducing photocopier or trick photography".

"Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC micro. It is easy to use yet highly versatile, and caters for all BBC screen modes in multitone high resolution printing. Whole, partial, rotated and scaled screens may be dumped to almost any BBC compatible dot matrix printer (see our list at the end of this advert). At £24 it must represent excellent value for money and surely cannot be beaten".

Designed for use with the following printers: CP80, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, LPVII, NEC PC8023, DMP100/120/200/400, etc. etc.
Price including comprehensive manual

£24

P.S. Existing owners of Dump Out 2 may now upgrade to Dump Out 3. Please return BOTH the original ROM (with its label and serial number) and the manual to our "Upgrades Dept" with your remittance.

For a limited period only **£10.00**

VIEW

VIEW WORDPROCESSOR
We are supplying the new VIEW version 2.1 allowing printing of memory contents etc **£46**

HI-VIEW

A special version of VIEW designed for use with 6502 2nd Processor. Available on disc, it offers 47K of text memory.

£49

VIEWSHEET (Acornsoft) **£49**

Watford's own Sophisticated VIEW PRINTER DRIVER for Epson FX80 & KAGA KP
Only £9

VIEW DRIVERS FOR JUKI & BROTHER PRINTERS
Only £8

VIEW/VIEW SHEET PRINTER DRIVER for SILVER REED
(Officially approved by Silver Reed)

A range of VIEW Printer drivers to complement the Silver Reed range of printers EXP400/500/550 & 770 EB 50 and converted typewriters EX43/44 & 55.

Only: £8

BEEB PRINTER ROM



This utility ROM is designed to simplify using all the facilities of your printer. It has many facilities:

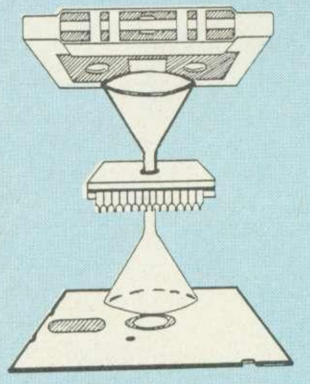
★ Selection of printer modes such as underline, font and size is by 'Single Key' operations.
★ From Wordwise, a single number following OC will select a mode rather than a long and incomprehensible string of control codes. This makes using your printer with Wordwise much more convenient.
★ When using Basic (or other languages) you can have control over the formatting of the output to the printer in the style of a wordprocessor. You can define page top, bottom and side margins etc. with intelligent page skip for binders an option. All supported printers will now respond to form-feed etc. commands.
★ User defined characters are printed as you see them on the screen so that non-standard characters are automatically printed out correctly.
★ Commands select the options for the following printers:
GP100, STAR, NEC, MX/FX, KAGA, LP/VII/DMP100, DMP200.
Operates with either parallel or serial interfaces.
★ Supplied with a 50 page manual that is very comprehensive and easy to follow. Please specify printer type when ordering so that we can send the correct function key strip.

Price: £24



TRANSFEROM

(Tape to Disc Utility)



After months of top secret development, we are now able to supply details of this advanced and sophisticated utility ROM for the BBC micro. Just look at the features:

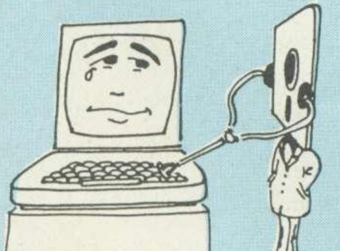
- Fully menu driven for ease of use
- Copes with locked programs
- Copies Elite
- Copies Aviator
- Copies very long adventure games
- Supplied with comprehensive manual

The single density DFS version of TRANSFEROM is available NOW, and the double density version is in preparation as YOU read this very advert.

TRANSFEROM takes your software on tape and saves them onto disc. TRANSFEROM does not stop when one disc is full; you just insert another disc in and carry on with that one! Surely this is the most valuable investment you could make if you have tape software that you wish to transfer to disc!

Introductory Price
£22.00

DIAGNOSTICS DISC



The BBC micro is a very complex machine and thus diagnosing a fault can be very difficult. Until now, the only way to discover the nature of a fault was either to find a competent friend with a large degree of patience or to find your nearest dealer and pay him to find out what is wrong.

At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

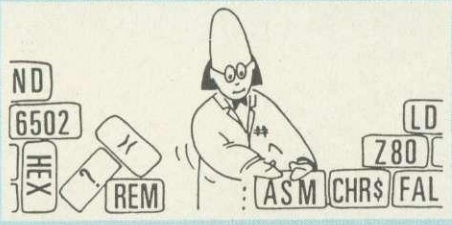
RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Trial Price
Only £15.00

ROMAS

THE CROSS ASSEMBLE AND MACRO EDITOR FOR SERIOUS PROGRAMMERS!



ROMAS is a carefully designed, sophisticated yet simple to use, development system for serious assembly language programmers. Using the BBC as the development system, you can choose your target system from the following processors:

6502, 65C02, Z80, 8085, 8041, 6809 and Z8

ROMAS features a powerful expression analyser, making complex table easy to generate. To aid in documentation, fully formatted assembly listings may be produced, with full symbol table output at the end.

ROMAS is provided with a powerful cross referencer to produce a listing of all the labels in a given "source" program; this makes it easy to check to see if you are about to duplicate a label.

The Macro Editor

Features of this powerful editor provided with the ROMAS package include:

- Works in all 40 and 80 column screen modes
- Fast load and save speeds
- Continuous line and column number displays
- Search, replace and move; all available in macros
- Command repetition

The ROMAS package includes two comprehensive manuals, providing detailed documentation and plenty of examples.

A give away at . . .
Only £45

Special Offer

Purchase a copy of ROMAS and our EPROM programmer (retail price £113.00), and we'll give you the very special price of:

£99.00! (£4 p&p)

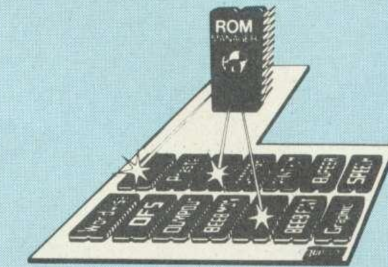
Watch this space
DELSYS is COMING

ADE

'Systems' complete program development package in a 16K ROM. Full assembling and debugging facilities provided. We are now supplying the new 6502 2nd processor compatible version.

SPECIAL OFFER ONLY **£43**

ROM MANAGER



'Provides comprehensive management of all your installed ROMs – BEEBUG Nov. '84'.
This ROM is unique in its capabilities. It allows you, the user, full control over the BBC Micro's sideways ROM paging system with simple to use commands. This ROM is essential for those with several ROMs. At a simple level ROM MANAGER can be used to remove the problem of clashing command names and allow full use of all the facilities of your ROMs. This is coupled with facilities to completely enable or disable various ROMs in the machine including ROM manager itself.
ROM MANAGER can also be used to develop sideways ROMs using the machine's standard memory. This is achieved by sending sideways ROM calls to your code in RAM, saving the expense of fitting sideways RAM for ROM development purposes. ROM status reports are also given by the ROM, including ROM lengths, checksums, entry points supported and current filing system title.
The ROM also provides facilities to examine ROMs, list function keys for editing, modify RAM (using a HEX/ASCII editor) and list ROM titles neatly and concisely.

All selection between particular ROMs is by the name of the ROM and this may be abbreviated for convenience. ROM numbers can also be used if required. This ROM is very simple and obvious to use. All the facilities are explained in the clear and detailed manual.

Price **£22**

DISC EXECUTOR

Disc Executor is a sophisticated disc utility for the transfer of your programs from cassette to disc. It copes with 'locked' files and full length adventures (up to &6E blocks long) and programs that load below &E00. Disc Executor is simple to use and provides menus to prompt the user along the way. Disc Executor will cope with the vast majority of tapes. (Please note that Disc Executor is not compatible with double density disc interfaces – keep reading our adverts though!)

Price only **£10**
(Please specify whether 40 or 80 track disc when ordering)

ULTRACALC 2

The mark 2 version of the BBC Publications extremely popular electronic spreadsheet ROM. Features include: Simple communication with program, with many prompting messages; Full range of editing commands; Efficient memory usage, allowing large spreadsheets to be constructed; The handling of labels, as well as numbers, as values; Individual variations of the width of columns; Display available in all screen modes; Operates as HICALC on 6502 2nd processor giving 44k of workspace; Flexible printer controls.

Only: **£66**

Continued →

Nightingale Modem

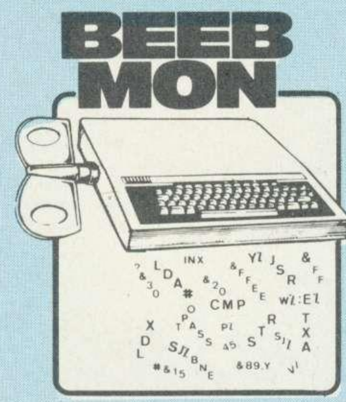
Now Watford brings you PACE's NIGHTINGALE MODEM PACKAGE including the popular Commstar ROM software for the BBC Micro. Nightingale is considered to be by far the most versatile BT approved modem available at the price for the BBC Micro. It is ideal for home or business use. It offers Prestel/Viewdata baud rates (1200/75 & 75/1200) as well as 300/300 baud full duplex for communication between BBC and other computers, including bulletin boards. A bargain at our

SPECIAL INTRODUCTORY OFFER

(Price includes COMMSTAR ROM & comprehensive manuals) **£119**

Nightingale Modem without software
Only £99

COMMSTAR ROM package only **£29**
(P&P on modem £2.00)



Watford's own Machine code Monitor ROM written by Andrew Bray (Cambridge), co-author of the BBC Micro Advance User Guide.

The most powerful and versatile machine code monitor ROM yet written for BBC Micro. It has all the normal memory editing, moving and relocating facilities, plus all editing is with a full screen editor allowing scrolling up and down memory, entering in Hex, ASCII or standard assembler mnemonics.
In use as a debugging tool, you run code under a total emulation system. Ever felt a desperate urge to set a break point in ROM? No problem – you can even have breakpoint on reading or writing locations in memory and on register contents. The system fully supports debugging of sideways ROMs e.g. BASIC can fully and easily be run from within Beebmon and from there DFS and other sideways ROMs can be used in total emulation mode.
Beebmon can even run itself. In so doing you can nest Beebmon up to a level limited only by the memory size. Beebmon uses 256 bytes of workspace, located anywhere in memory, even on the 1MHz Bus. Beebmon effectively uses no zero page workspace, so your program (e.g. BASIC) can use any or all of the base page. How does it achieve this? By providing a 6502 interpreter all programs running under it exist in a virtual BBC, so special memory locations like the ROM latch are not actually accessed by your programs, instead they alter a location in Beebmon's workspace. Emulation also allows immediate return to Beebmon command level by ctrl-escape no matter what code is being executed at the time. All this exceptional power and flexibility is complemented by a clear and detailed manual included in a value for money price of:

£24

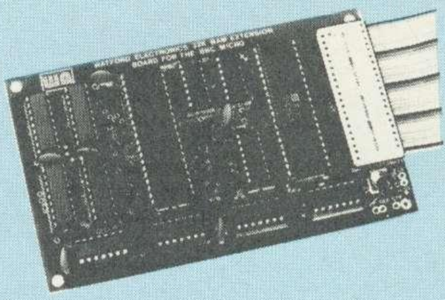
DISASSEMBLER ROM

Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use progammers tool.

ONLY **£18**

Please write in for technical details.

32K RAM
EXPANSION BOARD



Now Watford Electronics brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. It's ribbon cable simply plugs into your micro's 6502 processor socket. This compact board which fits inside the computer doesn't just give you 16k or even 20k of extra RAM, but a massive 32K!!!

There are many more useful facilities available with this board:

- The top 20K of the expansion RAM can be used as the screen display memory, leaving all the standard BBC RAM free for programs or data storage. This allows good graphics and long programs to be combined. For instance you could have MODE 0/1/2 GRAPHICS AND 28K OF PROGRAM SPACE. The extra memory can be used by virtually any language or utility such as BASIC, VIEW, WORDWISE (1.20+), WORDWISE-PLUS, etc. and NOW COMPATIBLE with Beebug's TOOLKIT.
- The FULL 32K or the bottom 12K of the expansion RAM can be used as a PRINTER buffer for SERIAL PARALLEL printers, sound channels, RS423, keyboard or speech synthesiser. This allows very long text files to be printed while you are using 28K of program and 20K of graphics! THE BUFFER IS UNIQUE because it replaces one of the BBC Micro's buffers so all the buffer options are available on it. eg. *FX15,21, 138, 145, ADVAL(−no.) etc.
- This board is the IDEAL COMPLEMENT to any WORD PROCESSING system, disc or cassette based. There is no need to wait for slow printers as you can type in long text in 80 column display mode while printing is going on – TWO JOBS DONE SIMULTANEOUSLY!!! (an equivalent printer buffer would cost you £120 +).
- Unlike our competitors, the board is compatible with a vast range of software and hardware available for the BBC microcomputer, including our ROM expansion boards, double density DFS units, and the ATPL ROM extension board. This is because our board is connected to the computer by means of a ribbon cable without soldering. It can either be left in the micro or stuck to the lid with the 4 self adhesive feet supplied.
- The board comes with a comprehensive manual and ROM based software with a large range of commands for machine code and BASIC users, including many *HELP messages.
- Now the ROM has had a host of utilities added to the large number already provided and has been made even easier to install.

Only: £65

GRAPH PAD

With this popular British Micro's Graph-pad, you can add new dimensions to your computer enjoyment. It helps you to create your own application programs by the simple use of the Graphpad. Ideal for Educational use. Supplied complete with Cables, Manual and a two program cassette.

SPECIAL OFFER **£86**

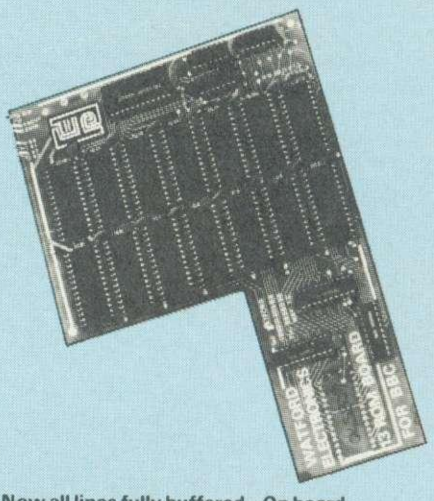
BEEBFONT ROM

BEEBFONT is a remarkable and different concept in BBC software supplied on a 16K ROM. It allows you to display text on the screen in 13 different styles:

It works in modes 0, 1, 2 and 4 using the full colour capabilities of each mode. Characters are printed in the same way as normal. Selection between the various fonts is very easily achieved with Ctrl-V – press this followed by a font number and the output will continue in the new font. Beebfont ROM is particularly useful in display work with the characters produced at twice the normal size.
You can create your own character fonts with the editor supplied. You can also print-out pre-formatted text files using the special characters with Epson FX, RX and NEC printers. The full range of character styles can be used, controlled from within the text. The editor and spooler program are supplied with the package, on cassette or disc. The spooler allows word processor (Wordwise & View) output to be printed in the new characters.
A twenty page manual is supplied. Please state printer type and media for the editor & spooler when ordering (cassette, 40 or 80 track disc).

ONLY **£32**

Mk-2 13 ROM SOCKET EXPANSION BOARD



Now all lines fully buffered – On board battery back-up facility – will now accept EPROMS 2716, 2732, 2764 & 27128 and ROMs 6116 & 6264.
Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 5 solder connections to be made. Full instructions are supplied. Unlike other ROM Boards, this board has been ergonomically designed to enable the user, easy further expansion inside the Micro, e.g. Double Density Board, Torch Board, RAM Card, etc., without any clash. (At Watford, we think ahead).
Our Mk2 13 ROM Socket Board enables the User to increase the sideways ROM capacity from the basic 4 sockets upto full 16 capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)

The Board gives the User, plenty of freedom to explore the possibilities of the new paged ROMs due in the coming months and offers them the chance to develop their own.

All lines are fully buffered and the board meets or exceeds all timings for operation in the BBC Microcomputer.

Supplied ready-built and tested complete with fitting instructions.

Only £30

PCB NI-CAD Battery for ROM Boards.
£2.75

COMPUTER CONCEPT'S ROMS

CARETAKER Basic Utility	£28
Graphics ROM	£28
Disc Doctor ROM	£28
TERMI	£27
COMMUNICATOR	£58

Wordwise

Without doubt a very sophisticated piece of software for the BBC Micro. It has all the features of a professional word processor yet is easy to use.

SPECIAL OFFER THIS MONTH: **£32**

WORDWISE PLUS

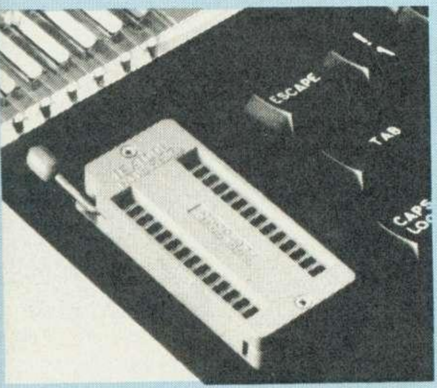
Now available from stock **£47**

WORDWISE PLUS UPGRADES

Existing users of Wordwise can upgrade to WORDWISE + for £17. Please return the old WORDWISE package complete with Chip and MANUAL with your remittance and we will send you the new WORDWISE + package.

£17

SIDEWAYS ZIF SOCKET



Now Watford Electronics brings you a ROM board for small budgets or for those of you who do not wish to open up your Micro frequently. It allows you to change ROMs quickly and efficiently with the minimum of effort – no screws to loosen or keyboard to remove. The unit consists mainly of a zero insertion force (ZIF) socket on a small circuit board which is located into the position of the 'ROM Cartridge' and is connected to one of the internal ROM sockets via a ribbon cable.

- Very simple to install. NO SOLDERING REQUIRED. The ZIF eliminates the possibility of damage to your ROM pins when inserting and extracting them.

- The low profile of the socket allows unrestricted access to the keyboard, unlike other cartridge systems. In addition, there are no costly extras, such as ROM cartridges for every new ROM.

- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.

- This versatile hardware solves the problem of running out of socket space, simply unplug the ROM and plug in a different one. It is a real must for Professionals and Hobbyists alike.

ONLY **£18**

THE AMX MOUSE

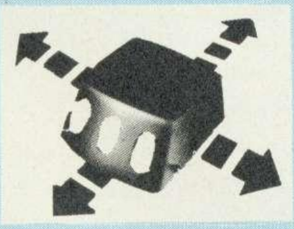
'The program is simplicity itself and the user manual is virtually redundant' . . . Micro User Jan. 85.

Bring into your home or office the last word in user friendly input devices for the Beeb. The AMX MOUSE that won the hearts and the minds of thousands of visitors at the Show has arrived at Watford Electronics at a very special price!

Using simple Icons, and small movements of the mouse on a work surface, you can select any one of the functions from the pull down menus. The mouse will operate from within Wordwise, View and many other software packages. The three buttons built in to the mouse are user programmable for many extra functions.

The package consists of the mouse, the advanced controlling software in ROM and a disc containing the Icon designer and the AMX ART software.

To summarise this superb product a comment passed by a very senior authority on BBC micro at the last Micro User Show was, 'My only criticism of the product is that, IT'S TOO CHEAP!'



OUR SPECIAL PRICE

ONLY: £68.50

FREE FREE FREE

This month we are giving away the sophisticated COLOUR ART package absolutely FREE with every purchase of the AMX Mouse from Watford.

COLOUR ART!

As seen at the Micro User Show

Watford Electronics has long been a source of innovation in the BBC field; e.g., we were the first to market a ROM board. Well now We've done it again!

The AMX Mouse is, as we are sure you already know, a very easy to use and powerful drawing package. Throughout the country, there is no single bigger distributor of this excellent package than Watford Electronics. To celebrate this fact, we are, during this month only, including FREE with every AMX Mouse package purchased from us the superb piece of software called COLOUR ART.

This novel program allows you to add COLOUR to any drawing produced with your AMX Mouse package, and really bring those pictures alive. Not with just any colours, mind you, but a full range from up to 255 different shades! It's simplicity itself to use this "painting by numbers" painter to create simple, striking and powerful images to please the eye.

Price **£13**

NEW

16K DISC RAM

This is the RAM you've been waiting for!! This battery backed up, write protectable 16K sideways RAM board allows you to run from disk every sideways ROM available. Beware of other sideways RAM boards which are not backed up as certain ROMs will not run in these boards even though the RAM can be write protected. The Battery Backup facility allows retention of DATA after power off. On switch on the Micro will think the WATFORD DISC RAM is a ROM. Features available are:

- No soldering or modifications to BBC micro necessary.
- Plugs into normal ROM socket fitting neatly under the keyboard allowing room for other add-ons.
- Easy to use. Comes with disk based software to SAVE and LOAD ROMs. Allows you to make backup copies of your ROMs.
- Disk software can be copied onto other discs when disc is full.
- All existing ROMs can be stored on disk and used in DISC RAM.
- No messy plugging and unplugging of your ROMs. Simply Load the one you want into DISC RAM.
- Ideal for Professional users to develop ROMs. Backup facility allows testing of final versions without using EPROMs.
- The switch provided allows backup and write protection to be switched off externally.
- Can also be used as 16K printer buffer RAM.

New Low Price: £35

P.S. 16K DISC RAM Board is not designed to work in conjunction with a Sideways ROM Board.

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SIMPLY the best! – An unlimited speech synthesis system. Complete with easy-to-follow manual. Controlling software is in ROM so no Cassette Loading problems!

PHONEMES for word synthesis – That means unlimited vocabulary! No extra speech dictionary chips to buy!

BUILT-in Library of approximately 500 words to get you started.

ENGLISH accent – Utilises inflexion techniques to produce highly comprehensible speech.

EASY to use system – Just plug the software ROM into a socket, the Speech unit into the User Port, and away you go! No specialised 'dealer upgrade' required!

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We know this all seems to good to be true but DON'T BE LEFT SPEECHLESS! Order your Versatile Speech Unit now!

SPECIAL OFFER £35

Continued →

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BBC Micro Book BASIC Sound & Graphics	£7.95
BBC Micro Graphics and Sound	£6.95
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BBC Micro **ROM PAGING** System Explained	£2.00
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Using BBC Basic	£6.95
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THE EPSON RX/FX/KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX/KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English how to use your printer (Kaga KP810, Canon PW1080A, or any other Epson FX-80 compatible printer) with the BBC micro, both from Basic and your Wordwise wordprocessor.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

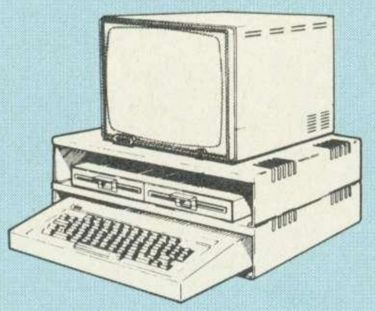
This book is superb value at only
£5.95 (Book – No VAT)

MYSTERIES OF DISC DRIVES AND DFS REVEALED

This excellent informative book on various Disc Drives and DFSs is now available at:

£5.95 (Book – No VAT)

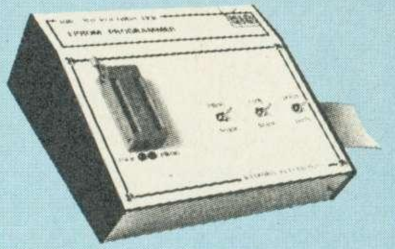
PLINTHS FOR BBC MICRO AND PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH	**£11** (carr. £1.50)
DOUBLE BBC PLINTH	**£19** (carr. £2.00)
PRINTER PLINTH	**£10** (carr. £1.50)

EPROM PROGRAMMER



The Watford Electronics' EPROM programmer for the BBC micro is a high quality self contained package. Programs all popular EPROMs from 2K to 16K: 2716, 2516, 2532, 2564, 2764 and 27128. All manufacturers' specifications have been followed to program EPROMs at the correct speed – wrong timings could destroy your EPROMs. The unit has its own power supply so does not put heavy loads on the BBC power supply as do some other units. Connects directly to the 1MHz bus following all Acorn recommendations on addressing and bus loadings.

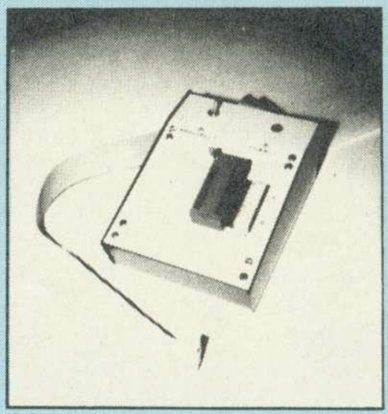
SOFTWARE PACKAGE
The software is supplied on an EPROM which plugs into the Micro and is instantly available with a single command (no time wasting as on Cassette/disc loading). It is a fully purpose designed and integrated package to simplify ROM development. The system is menu driven with many prompts to avoid any accidents.

Software facilities include:
Load File – Save File – Down Load EPROM – Program EPROM – Verify – Blank Check – Editing of memory contents prior to programming.
Also included is an automatic system to allow Basic programs to be put in EPROM and accessed through the *ROM filing system. More than one program may be put in an EPROM. All these facilities and more are explained in the comprehensive and clear 15 page manual.

SPECIAL OFFER £69
(£3 carr.)

LOW COST 'DIN' EPROM PROGRAMMER

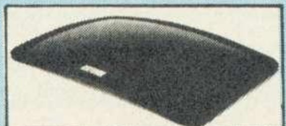
A high performance, low cost, self contained 'DIN' EPROM PROGRAMMER for the BBC Micro. Plugs into the BBC Micro's user port.



The features are:
- Will program 2716, 2732, 2532, 2764 & 27128 EPROMs.
- Copy Eprom into memory and compute checksum.
- Blank check EPROM.
- Program EPROM from memory.
- Verify programmed EPROM and display checksum.
- All * commands may be used from menu mode.
- High speed programming on 2764 & 27128.
- Machine code SOFTWARE supplied in ROM.

Only: **£49.50** (carr. £2)

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HEADACHES? TIRED EYES? Don't take pills – Use a Watford Electronics anti-glare filter!
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Available in 12" & 14" versions – please specify the exact monitor type when ordering.

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Protection for only **£9.50**

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A 'Keyboard to Micro' replacement jumper lead.

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The Attache carrying case is attractively finished in mottled antique brown leatherette. The case is made of tough plywood, providing a very solid and safe way to carry your BBC micro. There is room provided to fit all the leads necessary behind the computer and manuals in the front. Locks supplied with two keys. Price **£11** (£2 carr.)

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(All ready made and tested)

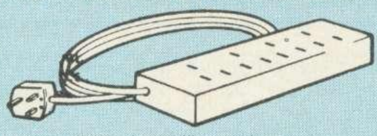
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to 5 pin DIN Plug + 1 Jack Plug	£2.00
to 3 pin DIN Plug + 1 Jack Plug	£2.00
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KAGA/SANYO Colour Monitor Leads	£5.00
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DISC DRIVE POWER LEADS
Supply from BBC power supply to standard Disc Drive connector.
Single **£3.00** Dual **£3.75**

MISCELLANEOUS CONNECTORS

	Plugs	Sockets
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Cassette (7 pin DIN)	25p	65p
ECONET (5 pin DIN)	20p	30p
Paddles (15 pin 'D')	110p	215p
BBC Power Plug 6 way	80p	–
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4 way top quality mains trailing sockets. Supplied wired up with mains plug ready for use. Can be screwed to floor or wall if required. Very useful for tidying up all the mains leads from your peripherals. Allows the whole system to be switched on from one plug. **£9.99**

THE INVESTIGATOR

This sophisticated Utility program on disc, enables you to make security back-up copies of most of your valuable Disc Software. Makes full use of all 8271 (will not run with double density DFSs) facilities to discover the precise format of your protected disc so that an exact copy can be produced. Supplied with detailed instructions. Please specify 40 or 80 track disc when ordering. Only **£20**

Access
ACCESS HOT LINE
0923 50234
24 Hours

ACORN SPEECH SYNTHESIZER

Speech Chips, manual and full fitting instructions.

Only £19.50

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SNOWBALL ADVENTURE	£8.50
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Please add £2.50 for Discs

MISCELLANEOUS

28 pin ZIF SOCKET (Textool) **£6.95**

28pin DIL PLUG

SOLDER type	£2.90
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28way **55p/ft**; 34way **60p/ft.**

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74LS123	£1;	74LS163	70p
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74LS393	£1.20;	4013	60p
4020	£0.90	4816	£1.50
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6522	£3.40	6845SP	£7.50
SAA5050	£8.75	SN76489	£5.50
2764-250nS	£4.25	27128-250nS	£9.75
6116LP-2K	£3.25	6264LP-8K	£9.95
8271	£50	ACORN DNFS	£15
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SLEUTH ROM **£25** TOOLKIT ROM **£23**
BBC A to B Upgrade Kit **£45**

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.
- **ERASER EB** – Standard version erases up to 16 chips. **£28**
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Delta 14 handset – On its own makes a high quality centre sprung analogue joystick with fire buttons **£12.50**

Adaptor Module allows use of two joysticks and provides hardware to access all the keys on the keypad of the joystick **£12.55**

Transfer program allows use of the keypad keys and joystick to simulate any key on the keyboard. This works by creating a machine code patch that stays in memory while another program is loaded in. Allows any game to be used with joysticks. Supplied on disc or tape.

Tape **£5.10** Disc **£7.95**

STANDARD JOYSTICKS

These are standard analogue type with a fire button on each joystick. Twin joysticks go to a single moulded plug, long leads provided.

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Fast EPROMs for Sideways ROMs
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NEW
LOGOTRON LOGO

LOGO is a specially developed language carefully designed to teach the basics of both programming and logical, ordered thinking. Until recently, there wasn't a version of LOGO available for the Beeb. Now Watford Electronics are proud to bring the highly acclaimed version of LOGO from LOGOTRON. This version is recommended by most local education authorities.

Supplied on a 16k ROM for easy fitting, the LCSI LOGO is accompanied by a high quality ring bound manual for easy reference. Please note the LCSI Logo is not just the well known graphics section of LOGO, but the FULL implementation. Educational establishment making a quantity order? Contact us for a possible discount.

ONLY: £55

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Tel: Watford (0923) 40588/37774 Telex: 8956095 WAELEC

Write to: Letters, Acorn User, Redwood Publishing, 68 Long Acre, London WC2H 7ED

Double density disc dilemma

Sir, The scarcity of the 8271 disc controller and the availability of at least six double density disc interfaces, each claiming some degree of compatibility with the Acorn filing system and various Acornsoft products, subjects the decision to upgrade a BBC micro to discs to great uncertainty. I am frequently asked for advice on this and there is no unambiguous response I can make. This situation is most unsatisfactory and needs to be resolved quickly.

I assume that supplies of the 8271 will not improve and that this device may well become unobtainable. This belief, taken together with the capacity advantage of double density working makes the choice of a double density interface a natural preference. The problem lies in the non-availability of a suitable Acorn upgrade.

For users who are working wholly at a professional or commercial level the choice is easier in that there are only two suitable interfaces on offer, ie Kenda Pro and Mertec. Recourse to a Torch product might be a better option.

For home and educational users who need compatibility with software the choice is much more open, with seven contenders: Gnomic, LVL, Microware, Opus, Solidisk DDFS, Solidisk DCFS and Watford.

For those who already have discs the choice lies between the Solidisk DCFS and sticking to the venerable 8271 alone.

For those changing over to disc from tape now there is almost certain to be some degree of incompatibility. What is worse is the prospect that the degree of incompatibility cannot be estimated until there is a corresponding Acorn product to set the standards for double density systems.

These difficulties mean that a lot of the more productive users of the BBC micro are being forced to make leaps into the dark and once there is an official Acorn double density interface many may find their interfaces becoming increasingly incompatible and their supplier squeezed out of the market. It follows that the sooner Acorn resolves this question the fewer users will be put in this position.

I ask that Acorn should act now and either:

- state what disc controller should be used and its official location on the memory map,
- better still, actually introduce a double density disc interface upgrade for the BBC,
- or adopt, license or otherwise qualify whichever of the currently available interfaces is most satisfactory from Acorn's viewpoint.

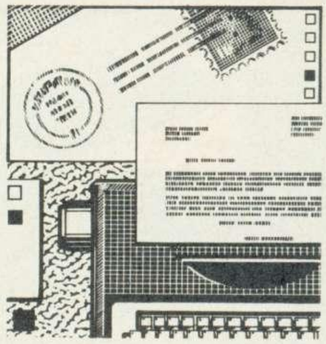
If Acorn does not intend to support the BBC micro with a double density disc interface then this should be made clear. Then those users who have adopted a wait-and-see attitude can get down off the fence.

E Stevenson
Rolls-Royce and Associates Computer Club
Derby

Interface the facts

Sir, Robert Macmillan of Acornsoft is surely right when he says that preventing us from over-writing our files is the business of a filing system, not of an applications package (Letters, April). However, one can see why he did not expand his remark, since the real cause of the difficulty is the Acorn disc interface.

This product conspicuously lacks the elegance and polish of the rest of Acorn's output, and it must have hindered considerably the development of disc-based software for the BBC micro. It's based on an expensive, obsolescent and difficult-to-obtain controller



chip; it needlessly restricts the user to 31 files per side and four disc surfaces; and it takes nearly 3000 bytes of memory for its workspace.

Compared with other disc operating systems (the Tandy TRS-DOS, for instance) the Acorn DFS is distinctly rudimentary in its facilities.

As an indication of what might have been, consider the Kenda DMFS. It treats both sides of the disc as a continuous surface, allows over 350 file-names (of up to 11 characters) and it leaves Page at &E00 because it carries its own workspace. And when you save a file using an existing file-name, the earlier version is not destroyed but merely transferred to a special 'erased' directory, from which you can retrieve it at any time. Only after a second erasure is it lost entirely.

Perhaps it is not too late to hope for such facilities in the forthcoming ADFS.

R Lambley
London

Putting triangles into the paintbox

Sir, Rob Fenton's *Paintbox* program (February issue) was just what I had been looking for, and I was very pleased with the results when I had typed it in. Just one grouse – no triangles! Having inserted a facility for these in my own version, I am passing on the modifications I made, as they may be of interest to others.

I reckoned that I could usefully employ eight different triangles (see dump, right). Each is labelled with a number, and shows the position of the cross-hair.

After inserting these modifications in the program, one of the numeric keys 1–8 will draw the appropriate triangle.

One further tip for dumping a picture to a printer is to include the command.

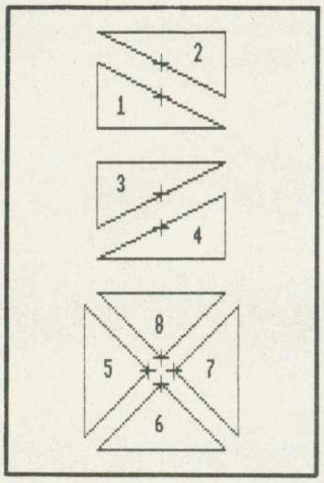
VDU28,0,0, ?&30A,0

immediately after setting the mode (eg line 85 in the *Paintbox* program). This restricts the text window to the top line of the screen, and ensures that when I subsequently CHAIN a suitable dump program the command will not spoil the picture. Usually I also restrict the graphics window so that it does not extend to the top line of text, but in the case of the *Paintbox* program the single modification neatly deletes the palette prior to the dump.

Mary Clayton
Beds

PS Thanks for the tip about sending delete characters to a printer – it's obvious when you know how!

The *Paintbox* program including these modifications is on this month's listings cassette.



Alter line 10 to:

```
10DIM XST%(4),YST%(4)
```

Add lines:

```
631IFINKEY-49 PROCTRIANGLE(1,2,3)
632IFINKEY-50 PROCTRIANGLE(1,4,3)
633IFINKEY-18 PROCTRIANGLE(1,2,4)
634IFINKEY-19 PROCTRIANGLE(2,3,4)
635IFINKEY-20 PROCTRIANGLE(1,2,0)
636IFINKEY-53 PROCTRIANGLE(2,3,0)
637IFINKEY-37 PROCTRIANGLE(3,4,0)
638IFINKEY-22 PROCTRIANGLE(4,1,0)
```

and lines:

```
 2240DEF PROCTRIANGLE(I%,J%,K%)
 2250XST%(0)=X%:XST%(1)=X%-CX:XST%(2)=X%
-CX:XST%(3)=X%+CX:XST%(4)=X%+CX
 2260YST%(0)=Y%:YST%(1)=Y%+CY:YST%(2)=Y%
-CY:YST%(3)=Y%-CY:YST%(4)=Y%+CY
 2270MOVE XST%(I%),YST%(I%):MOVE XST%(I%
),YST%(I%):PLOTK,XST%(J%),YST%(J%):PLOTK
,XST%(K%),YST%(K%):PLOTK,XST%(I%),YST%(I
%)
 2280ENDPROC
```

Let's meet more foreign characters

Sir, In completing the Readers survey in the March issue, I had a clear impression that the opinions of readers (and potential readers) outside the United Kingdom are of little interest to *Acorn User*.

I hope this is mistaken, because your magazine is particularly valuable outside the UK for keeping up to date and obtaining information.

Despite having access to BBC television by cable in Brussels, and even having Acorn stockists, this is certainly not always easy.

I should therefore like to express the wish that the opportunity presented by the Olivetti 'rescue' will be taken to take more account of existing and potential users of Acorn products on this side of the English Channel.

In this context, I should like to point out a problem with mode 7, corresponding exactly to the transmission codes of the Ceefax/Oracle teletext service. No doubt for what at first sight appear to be good reasons, the option for redefining displayable characters normally available by VDU 23 (. . .) (*User Guide* p. 384), is prohibited in mode 7. Unfortunately, the versions of teletext adopted for different languages in other European countries incorporate certain differences in the character repertoire, concerning specifically those having ASCII codes 35, 64, 91, 92, 93, 94, 95, 96, 123, 124, 125 and 126.

To enable the standard mode 7 character set to be redefined for one or another of these other languages, which would make the computer more competitive in Europe, it would be necessary to allow the characters with these codes (and those with codes 128 and higher) to be redefined by the user.

On the Olivetti side, a very welcome development would be an interface enabling Acorn computers to be linked up to Olivetti electronic typewriters (especially if a suitable daisywheel with the ASCII character set was available which could be used for printing out program listings).

I look forward to reading of such developments – and the other implications of the Olivetti shareholding in Acorn – in *Acorn User*.

Alan Reekie
Brussels

Far from neglecting overseas readers, *Acorn User* actively encourages them. For example, our competitions have long closing dates to enable you to enter – and prizes have been won in Spain and Canada.

We received surveys from as far afield as the USA and Hong Kong, as well as most of Europe. However, there were no specific questions on the position overseas, because readers are so spread out that their replies would be statistically insignificant. And only one question (on TV areas) was irrelevant.

So, rest assured, *Acorn User* knows you're out there and has strong links – just looking at the letters pages must prove that!

We would welcome comments from teletext experts on the issue you raise – and, of course, from Olivetti.

Jumping galaxies on an Elk

Sir, I have managed to galactic hyperspace on the Electron version of *Elite*. Although slow to operate it can be done as follows. Hold down SHIFT and H all the time then press FUNC. If no message appears, press FUNC again.

After many key presses a message should come up. If nothing appears to have happened just play around with the function keys and eventually the jump will be complete. Occasionally you may get up to 25 light years of fuel, all of which is usable.



Jonathan Hallett (Deadly)
Cornwall

Sir, Having recently purchased a BBC micro, I decided to buy an Epson RX80 F/T. To find the best buy I consulted *Acorn User* (January issue), and decided Noddy Micros offered the best value.

According to the ad, this printer cost £208 plus VAT, with no postage mentioned. I sent off my cheque for £239.20 and eagerly awaited the printer. Instead I received a letter from Noddy Micros stating there had been an error and the price should have been £225.25 plus VAT plus postage (£4.90), making a total of £263.94.

Surely advertising should attract buyers through honesty, not lies? I'm now trying another shop, also from your magazine. Noddy Micros has lost my custom, and there's still no mention of postage in its advertisements.

A N Other

Buying by post: never take anything for granted

This is based on a real letter we received but the names have been changed, and it's typical of many complaints. The advertiser gets a price wrong, and the reader makes two errors – using an old issue to order from and assuming there is no postage to pay.

First we must say that the vast majority of advertisers are scrupulous and honest. However, dealing with mistakes and customers' problems is costly and time-consuming (the first thing Acorn did to save money was to close its customer services department) and many companies are sadly lacking in this area. In this case, the advertiser admitted a mistake and did not cash the cheque. It cost the reader inconvenience and postage, while the advertiser, quite rightly, lost a sale and gained a bad reputation with this reader and his/her friends.

The worst complaints we receive concern instances when a cheque has been cashed and the reader is billed for the extra, or a credit card has been debited for more than expected. Other problems crop up when a product is faulty or does not do what the buyer expected, or hoped. The money is cashed and the company may feel justified in not giving a refund.

Remember, you may know a lot less about things like printers and software than almost anything else you buy. In many complaints we receive, the reader has made a mistake in buying the product and is demanding his or her money back for what is then a second-hand item to the retailer. You're not dealing with enormous high street stores which can afford to write-off such things.

There are ways to limit the chance of problems. First, before you order, check the price by phone or post, especially if you've referred to a past issue. The effort and cost is insignificant compared to the price of hardware. Also, it will give you an idea of how good the company is at handling customers. If they don't answer the phone or reply to letters when you are trying to buy something, what chance do you have getting any future problems dealt with? Never assume anything. If postage or VAT isn't mentioned, ask.

When ordering by post, check with friends or a user group to see if anyone knows the product or advertiser. Keep a copy of your letter and the cheque number, with dates. Note down any phone calls including the date and name of the person on the other end. If anything does go wrong, these notes will be very important.

If you have a problem, write to the manager of the company giving a résumé of your problem in a letter on just one sheet of paper, with the full story attached. If you get no joy, go to the local trading standards office or the Advertising Standards Authority in London. Both have enormous experience in these problems, and consulting them doesn't cost you anything.

Finally, we receive as many letters of praise as censure, which isn't bad considering there are 100-200 advertisers in each issue, selling thousands of products to hundreds of thousands of readers.

Wordwise upgrade: the Plus factor

Sir, I would like to take the opportunity of replying to comments made by Nick Evans in the March issue about our *Wordwise* upgrade offers.

We did not know when offering the 1.2 upgrade that *Wordwise Plus* would be available later. The 1.2 upgrade was offered at least six months before *Wordwise Plus* and at that time we were neither working on nor planning to work on the new program.

The 1.2 upgrade was priced at £10 to cover costs, not to make a profit. The only reason the ROM was changed was to make it compatible with the Aries RAM board.

Wordwise Plus is an entirely new product consisting of a 16k chip, two manuals, cassette, etc, all completely re-written and selling at £49. At present we actually make a loss on every upgrade we send out and have just increased the price. Our simple advice to those unhappy with our upgrade system and charges is: please do not upgrade – it will save us money.

Incidentally, the car I bought last year is now an out-of-date model and they did not tell me at the time that an improved model was to be launched a few months later. The same could apply to the TV set, the video or indeed the computer itself.

Charles Moir
Computer Concepts

Nick Evans replies:
I accept that Computer Concepts is probably making no profit on the upgrade deals as advertised. However, I find it hard to believe that there was no development going on with *Wordwise Plus* when my correspondents bought their Aries upgrades. A product of such quality as *Wordwise Plus* does not just appear overnight.

The comparison between cars and software does not hold water since the development times are much greater and one is usually aware of development trends when buying an aging model. My correspondents were annoyed because *Wordwise Plus* was announced only two or three months after they had bought an Aries upgrade. The question of when Aries was first released has no bearing on the matter.

I have every respect for the quality of the service which Computer Concepts provides. I also believe the company supplies top-rate soft- and firm-ware. It is for these reasons that I am amazed at Mr Moir's letter. Is he really suggesting that he doesn't want customers to upgrade their software because it will save him money?

Keeping text and graphics apart

Sir, Thank you for Peter Sandford's excellent suite of graphics programs. Articles like these make *Acorn User* a very worthwhile buy.

Having said that, I have to add that the layout of the MODE 0 DOTFILL programs is carried over to the (necessarily) MODE 1 COLFILL set. Several alterations are needed to make these as well laid out as the DOTFILLS, and one, the text window, crashes the program in Mode 1!

Some of the alterations are:

450 IF w = 0 VDU 28,0,31,39,29 (if you leave it as printed the text defaults to the top of the screen and crashes the graphics).

Lines 340 and 390: change 65 to 100 to keep the text and graphics apart.

Several of the TABs and SPCs must go to make the mode 1 text fit in the available space. One glaring example is line 540, which prints the changing cursor positions all over the place. Taking out the TAB (40-LEN (mess$)/2) puts it right.

Finally, a tidy up of the %s. As given, they encroach on the pies on the left. I got over this by putting in the x co-ordinate part of line 2200 at new lines 2372 and 2374, so exploding the left-hand figures.

```
2372 B% = B% + VAL (A$)
2374 IF B% > 50 THEN x= xc + (r/5)*SIN(a3)
```

Bill Mitchell
Lincs

Latest round-up of games high scores

Aviator	Acornsoft	30,450	**P Hopgood***
Android Attack	Computer Concepts	1,132,985	**Jon Button***
Arcadians	Acornsoft	97,660	**Ian Boffin**
Battletank	Superior	98,640	**Adrian Foster***
Chukkie Egg	A&F	30,275,420	**Stephen Corcoran***
Crazy Painter	Acornsoft	279,790	**Richard Arundale***
Cybertron Mission	Micro Power	715,320	**Mark Bradshaw**
Fortress	Pace	117,500	**D Shavick***
Frak!	Aardvark	1,347,445	**Nigel Shaw**
Free Fall	Acornsoft	5,024	**Philip Comber**
Hopper	Acornsoft	46,649	**Jonathan Wolfe**
JCB Digger	Acornsoft	119,500	**David Perry***
Killer Gorilla	Micro Power	672,550	**O Beman***
Meteors	Acornsoft	498,500	**P Ludgate**
Missile Control	Gemini	469,225	**Ian Boffin**
Monsters	Acornsoft	257,060	**Ian Cook***
Mr Ee	Micro Power	542,250	**Ian Boffin**
Moonraider	Micro Power	583,750	**Lindsey Tasker***
Overdrive (BBC)	Superior	338,450	**David Perry***
Overdrive (Electron)	Superior	1,011,720	**P Ludgate**
Painter	A&F	203,690	**Nigel Shaw**
Pengo	Watford	230,310	**Tony Smith**
Planetoids	Acornsoft	2,896,500	**David Perry***
Pole Position	Atari	384,200	**Neil Mochrie**
Rocket Raid	Acornsoft	161,270	**Warren Day**
Snapper	Acornsoft	1,149,390	**Peter Simpson**
Space Adventure	Virgin	4,890	**Mark Bradshaw**
Starship Command	Acornsoft	8,420	**Ian Boffin**
Zalaga	Aardvark	23,460,500	**Ian Boffin**

** Scores unbeaten since April*

Number Two does it better

Sir, It is regrettable that in your useful review of machine code monitors (March issue) you used Exmon I rather than Exmon II which replaced it in November 1984.

Exmon II is considerably upgraded. It provides some 60 machine code commands, has a full screen editor (hex, ASCII and assembler), and it has a full dual-screen graphic capability, allowing the user to single step using dual-screens, and to flip between graphics and control screen at the touch of a key. There is even a disc-based assembler facility.

Other features are also included which would make Exmon II the only monitor in your review to provide every feature detailed in your author's analysis table, including the use of up to 10 breakpoints.

Anyone requiring technical information or user support on Exmon II should telephone (0727) 60263.

Ian Tresman
Beebugsoft

Shortcomings of Acorn DFS (cont.)

Sir, With regard to the controversy over alternative DFS systems, I have yet to experience any problems whatsoever with my Watford 1.3 DFS. My original 1.2 would consistently hang up one program from the BBCSoft stable, but upgrading to 1.3 cured this.

Elite runs without any strange side-effects, though mine is a very early copy. Also running without any problems is the *Music System* from Island Logic. This disc appears to have an even weirder format than *Elite*, yet gives no problems.

Had Acorn produced a decent disc system in the first place, none of these alternatives would have been necessary. The whole of the disc system, from the obsolete 8271 to the DFS, is nearly as big a disaster as the notorious 0.1 operating system. If other suppliers feel they can do better, Acorn have only themselves to blame!

Pete Christy
Bucks

CENTRAL PROCESSING... CENTRAL PROCESSING...

Because of the large amount of technical enquiries we receive in the *Acorn User* office we are now unable to reply to individual letters. However, this new feature is intended to answer as many of your queries as possible, and should provide a useful information spot. Please keep your letters short and to the point.

Ivor Conroy, Tyne & Wear
Martin Phillips provided the final details to get *Trains* running in the June 1984 issue of *Acorn User*.

Richard Grant, Newcastle Upon Tyne
It certainly is possible to download programs from a disc and relocate them to &E00, providing they do not have any form of built-in protection that stops you. Computer Concept's *Disc Doctor* ROM has a suitable *DOWNLOAD command that will do this automatically. The *Tape to Disc* ROM from Vine Micros will also allow you to transfer most programs, even protected ones, from tape to disc and will load and download them for you. For unprotected programs a suitable Basic downloading program is possible and a suitable listing was provided by Martin Phillips on page 96 of the June 1984 issue of *Acorn User*.

Michael Johnson, London N16
The best way to test if you have your data disc in or not is to put a simple error handling routine in your program to 'catch' any 'File not found error'.

Ian Capps, Ashby-St-Mary
George Hill's Tape to Disc program appeared in the June 1984 issue of *Acorn User*.

I S Crawford, Banbury
The 65C02A processor is compatible with the standard 6502 (though the reverse is not normally true). The new version contains several more documented operation codes, although the standard BBC assembler will not be able to assemble these mnemonics in the normal way – check to see if the chip is supplied with a patch to the standard assembler to take care of this.

Peter Meulman, Australia
Only the latest versions of the Watford DDFS (version 1.52) will run *Elite* correctly. Watford will upgrade earlier versions of their DDFS and DFSs for a charge of £5.

Lindsey Gilchrist, London N3
There were no mistakes in the *Paranoids* program (September 1984) to my knowledge.

Sgt Hue, BFPO 29
Kay Dee Software, who produced the excellent Monopoly-type game *Pass Go* for the BBC micro, reviewed in January 1984, have unfortunately gone out of business. As far as I know, the game was not taken up by another software house.

Felicity O'Dell, Cambridge
I don't know of anyone manufacturing a keyboard overlay for the BBC micro.

J O Lewisohn, Wimbledon
You can prevent a clash between *Printmaster* and *Demon Zromm* commands: prefix all commands you wish to send to the modem software with a Z, ie use *ZUNLOAD. Alternatively re-arrange the ROMs within your Beeb, so that the commands you wish to use are in the ROM to the right-hand side of the ROM with which the clash is occurring.

C Palmer, Eltham
There were no mistakes in the *Picture Slide* program (January 1985), and this will run on an Electron (in fact it was written on one!). I suggest you look at line 3510 and ensure that you have not typed Os in place of 0s.

Simon Noddings, Hartlepool
The reason you need to swap the disc twice when copying a file from one disc to another using a single drive is that the file must first be opened on the new disc and then copied. This is simply a matter of housekeeping. If this is causing you real problems then why not just load the file into memory and then do a straight save of it? If the file is a data file it could be *LOADed to a specific address and then *SAVEd. It would not be easy to map an extra four ROM sockets into a single socket as you suggest. The power supply would be stressed with the extras you have. The ROM Box produced by Northern Micro (to be reviewed) might be worth considering.

Kitty takes you fast forward to successful tape loading



Q I recently purchased my Acorn micro by mail order, and have subsequently bought the BBC Data Recorder. However, I'm unable to load many of my software cassettes. On odd occassions the message 'Data?' occurs. Is my micro faulty or have I just been unlucky in purchasing bad tapes?

A Sinclair
Bishop Auckland

A This letter is similar to many I regularly receive from readers. The problem almost certainly does not lie with the micro or the software but in the cassette player. Some recorders are more compatible than others, though it's unusual for even the cheapest not to work successfully.

Obviously the BBC Data Recorder is the 'official' one and as such has been thoroughly tested with the aim of being the most compatible. The playback settings for Volume and Tone can be, and often are, critical to obtaining a successful load. As a rough rule of thumb, about two-thirds of total output level is best, but really it's a question of adjusting the levels as the program is 'Loading'. Once you are approaching the right level for your recorder, the title messages should start appearing, looking a bit like this:

```
PROGRAM 06
Data?
```

PROGRAM is the name of the program, and the number is the section number (here it's the 6th section). The Data? message means that the data being read in is corrupted and so the Volume/Tone requires slight adjustment.

Once the block messages begin to appear without a Data? message you have obtained the correct settings. Simply stop the tape, rewind it to the beginning and then press play.

There are other less common problems. For example, it's worth checking all the connections between your micro and the recorder itself. I can remember a friend who had similar trouble, only to find that it was created by a loose wire in the cassette lead.

Sticky tapes can also be problematic. It sticks to the recorder head, slowing it down and fooling the micro into thinking that the incoming data is faulty. Often a simple remedy is to perform a few fast forwards and rewinds. If the trouble persists, try cleaning the recorder head with a cleaning tape or a proprietary cleaner.

If the problem continues, then I recommend you consult your local dealer.

Q Each time I copy a set of programs from one disc to another any program that I have in the computer seems to disappear. Is there a fault on my computer?

Jean Burns
London

A When you copy a file from one disc to another, the micro has to load into memory from one disc and then save it to the other. Any program you have will be overwritten. The simple answer is to save your current work before you do any copying and then load it back in afterwards.

Joe Telford finds a friendly way to get to grips with structures

THE CASE FOR COMAL

WHEN programming for pleasure, stucture matters little. However, when teaching programming, or producing commercial code, it's important that code can be easily debugged and maintained. Although there are those who would say that structure is entirely in the mind of the programmer, and that a good programmer can write structured code in any Basic, I must play devil's advocate on behalf of the great number of would-be programmers.

Structure is about readability, and both speed and space are of lesser importance. There are times when experimentation at the keyboard leads the programmer to unstructured coding, but the benefit of readability (which structures carry with them) is very useful.

The important question of whether programming can be structured in an unstructured language is difficult to answer. Certainly many structures can be presented in pseudo-code (pseudo-code is an English-like statement of a problem solution), but these have then to be decoded into whatever Basic is in use. It is generally thought, particularly in education, that the closer to pseudocode a language can be, and the more rigorously it enforces a wide range of set structures, the easier it will be to inculcate good programming (and thinking) habits into those learning to use it. Hence the popularity of Pascal and Logo.

BBC Basic is a semi-structured language, and as such will allow programmers to be as unstructured as they wish. It would be very useful to convert to Pascal, but this might be difficult initially for the user who's been using Basic for a long time. So the ideal language is a 'Pascalized' Basic.

About five years or so ago I was amazed by a new language implementation on the Commodore PET computer – Comal, the COMmon Algorithmic Language. The means of getting the system up and running on the early PETs was quite horrifying, but there was talk of the language becoming public domain through the auspices of CBM. This, plus the claims of improvement over PET Basic, was sufficient to interest me in Comal.

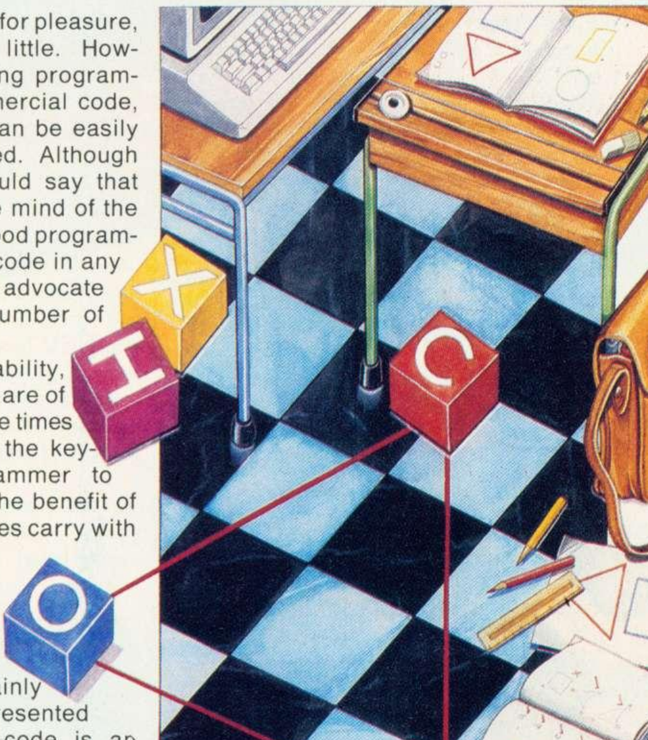


ILLUSTRATION BY BILL BUTCHER

Now Acornsoft has come up with an implementation for the BBC micro. As Acornsoft had put Comal in ROM, my first feeling was one of concern that I might find a bug. I fitted the chip and powered up.

```
*COMAL      gave me
  COMAL
  ]
```

My past experiences with Comal meant that I had some idea of what I could do with the language, despite not having looked at the manual. Readers unfamiliar with the Comal philosophy should see pages 72-78 of the March 1985 issue of *Acorn User*

I was looking for Basic plus the extra structures normally only associated with Pascal-like languages – and I was not disappointed. All the extra Comal structures exist and are hosted by the usual friendly Basic facilities. In fact the specification of this implementation is in excess of the 1982 International Standard for Comal.

The manual

Next I turned my attention to the manual – a 440-page epic, split into three parts.

The first part is aimed at the complete beginner, and teaches Comal programming in a frighteningly precise way. I don't dislike it, rather I am awestruck by it. After 164 pages of this type of tutorial, I suspect that an intelligent reader would be reasonably adept at Comal coding. Unfortunately this part of the manual doesn't consider Comal from a structured angle but concentrates on the facilities available, and on building up programming from scratch rather than via problem solving. *Beginning Comal* by Borge Christensen or *Structured Programming with Comal* by Roy Atherton might prove valuable.

The second part of the text assumes that the reader is quite familiar with BBC Basic or has digested the first part of the manual. It details the extensions to Basic which are embedded in Comal. Remember that the extensions will, of course, only work in Comal: they cannot be used with BBC Basic. There are quite a few of these, including new structures, commands and facilities. I'll examine them later.

There is also a section on memory organisation, error messages, program conversion and merging. The saddest find here was that the internal structure of Comal programs is not Basic compatible. Although it looks very similar, the tokens for reserved words are different.

The result is that conversion between languages has to be via ASCII, and occasionally the use of a wordprocessor is required to speed conversion. I found most of my conversion was from Comal to Basic, rather than the reverse, due to the clarity of structure and quality of error checking of the Comal interpreter. At present there seems little use providing commercial programs in Comal, so Basic to Comal conversion is of less value.

The final part of the manual is the reference section and it details every keyword in terms of its description, syntax and typical examples.

Extending Basic

Although Comal has its roots in Basic it would be wrong to assume that this implementation is just Basic plus. In fact we have a Basic-like language, in which we have to learn some things and unlearn others.

Starting from Basic is probably more of a hindrance than starting from scratch, when there would be no unlearning. If you wish to use the more powerful Comal stuctures, you will be forced to think clearly about algorithms, because Comal even refuses to let syntactically incorrect code be entered.

The Comal environment

Comal starts off by being more friendly than Basic. For example, if we type a simple Basic program:

```
 10 PRINT "Which table ";
 20 INPUT TABLE
 30 PRINT "Which number";
 40 INPUT NUMBER
 50 FOR LOOP=1 TO NUMBER
 60 FOR COUNTER=1 TO TABLE
 70 PRINT"*";
 80 NEXT
 90 PRINT
100 NEXT
110 END
```

when we list the program we find that a number of things have changed:

```
 10 PRINT "Which table ";
 20 INPUT table
 30 PRINT "Which number";
 40 INPUT number
 50 FOR loop:=1 TO number
    DO
 60   FOR counter:=1 TO
      table DO
 70     PRINT "*";
 80   NEXT counter
 90   PRINT
100 NEXT loop
110 END
```

First, the layout has been indented for clarity. Second, all variables have been rewritten in lower case. Third, the transparent DO keyword has been added to each loop. The NEXTs have sprouted variables and the = signs have become assignments (:=) where appropriate. Running the program shows that it works as expected:

```
Which table ?5
Which number?4
*****
*****
*****
*****
```

"I found most of my conversion was from Comal to Basic rather than the reverse, due to the clarity of structure and quality of error checking of the Comal interpreter"

So the Comal environment encourages tidiness by enforcing it. It becomes impossible to call a variable by twin names, eg, MONTH and month. The same applies to procedures and functions. It is also impossible to write multi-statement lines in Comal, although multiple variable assignments are allowed on a single line.

Program lines are checked by Comal at entry, and spaces are critical. Take, for example, the line:

```
50 FOR LOOP=1TONUMBER
```

This is entered and translates to:

```
50 FOR loop:= 1tonumber
```

which does not make sense, and so Comal rejects the line, saying:

```
Syntax error at line 50
```

then tries to help out with the syntax:

```
50 FOR loop:= 1tonumber
```

by pointing to the place where it became confused. Notice that Syntax Errors should only ever occur at program entry time, not during RUN time.

Comal has a rather interesting command which can be used directly. DEBUG reports on the state of structures in a program. If, for example, a program is written:

```
10 FOR place:= 1 TO 20 DO
20   x:= x + 1
30   y:= y + 1
40 END
```

and we type:

```
DEBUG
```

we receive a message:

```
10 FOR place:= 1 TO 20 DO
Unclosed at
40 END
```

which translates to mean that a FOR loop started in line 10 has not been closed with a NEXT line before the END of program line was found.

Such debugging is a boon to checking program structure, and is automatically performed on issuing the Run command.

The following are other 'toolkit' aids in Comal:

PRINT FREE gives the amount of free space not yet used by the program.
PRINT SIZE gives the program's size.
CONT allows the program to continue after a STOP, Escape or RUN time error.
DEL deletes program lines.
DELETE filename deletes a file.
SELECT OUTPUT <**d p s**> selects display, printer or serial output lines.
LIST lists the program in indented form.
EDIT lists the program without indents.

Handling variables in Comal

All variables in Comal are in lower case except the system variables: MODE, PAGE, TIME, WIDTH and ZONE.

Notice that MODE and WIDTH have become variables and that we have lost HIMEM and LOMEM. ZONE is a better replacement for @%. Page 218 of the User Guide indicates how important pseudo-variables can be constructed by examining particular memory locations.

MODE can now be allocated values, and interrogated directly, so that MODE := 4 gives mode 4 and PRINT MODE gives a numeric result.

Although all the normal rules of operators work in Comal, a couple of extras have been added: 10 value :+ 1 increments 'value' by 1; 20 clock :− 2 decrements 'clock' by 2; and 30 word$:+ "ending" adds "ending" on to word$.

Machine Language

Although we still have the ? and ! indirection operators, we unfortunately lose the $ operator, so that $&C00 := "HELLO STRING" is no longer available. Also missing is the facility to

dimension a block of memory for machine code. This is presumably because the entire assembler is not supported in Comal.

It is, however, possible to use machine code segments, but these should be loaded at PAGE, and PAGE incremented to protect the code.

Comal supports the PRINT USING command, which allows easy layout of numbers. For example, this program reads, columns and totals any number of numbers in a DATA statement:

```
 10 total := 0
 20 WHILE NOT EOD DO
 30   READ number
 40   PRINT USING "###.##"
      :number
 50   total:+number
 60 END WHILE
 70 PRINT "------"
 80 PRINT USING "###.##"
     :total
 90 END
100 DATA 3,12,.14,34.031,
    123.5
RUN
  3.00
 12.00
  0.14
 34.03
123.50
------
172.67
```

Notice how easy the laying out of figures is. Notice also the use of :+ to increment the total. The whole routine makes use of a very powerful loop structure between lines 20 and 60. The WHILE. . .END WHILE structure checks for the End Of Data (EOD) and while that is not true (ie, there is some data) the loop is executed. The difference between this type of loop and the REPEAT UNTIL loop is that a REPEAT UNTIL loop would need to execute at least once, even if there was no data.

Decisions in Comal

Unlike Basic, the IF construction in Comal is extended so that it becomes a structure in its own right. Take this example:

```
 10 INPUT "x location=":x
 20 INPUT "y location=":y
 30 IF x>0 AND y>0 THEN
 40   PRINT "1st Quarter"
 50 ELIF x<0 AND y>0 THEN
 60   PRINT "2nd Quarter"
 70 ELIF x<0 AND y<0 THEN
 80   PRINT "3rd Quarter"
 90 ELIF x>0 AND y<0 THEN
100   PRINT "4th Quarter"
110 ELSE
120   PRINT "On an axis"
130 END IF
140 END
RUN
x location=-34
y location=22
2nd Quarter
```

This routine converts x and y co-ordinates to indicate the quadrant on a graph where the co-ordinates would lie.

Notice that the four quarters are taken into account by the IF and ELIF constructions, and that the ELSE construction nets anything which slips through. The END IF line closes the IF structure.

A similar structure is CASE, which allows decisions to be based around the value of a single variable – as an example consider a doodling program which uses the numbers one to nine as possible directions for drawing a random line. We might use a CASE structure to alter the co-ordinates of the drawing point depending on the value of 'direction'. We use a line beginning:

CASE <variable> OF

as shown in this random doodler:

"This implementation is friendly, swift, apparently free of major bugs, well documented, full of useful facilities and it is easily learned"

```
 10 MODE :=4
 20 x:=640;y:=512
 30 MOVE x,y
 40 REPEAT
 50   DRAW x,y
 60   // choose random
      number 1..9
 70   direction:=RND( 1,9)
 80   CASE direction OF
 90   WHEN 1,4,7
100     x:-4
110   WHEN 3,6,9
120     x:+4
130   OTHERWISE
140     NULL
150   END CASE
160   CASE direction OF
170   WHEN 1,2,3
180     y:-4
190   WHEN 7,8,9
200     y:+4
210   OTHERWISE
220     NULL
230   END CASE
240 UNTIL FALSE
```

Notice that we use two CASE structures. The first accounts for the x element of the direction and the second for the y element. For purity we include the OTHERWISE construction, which says do nothing if any other numbers are found. One of the values of the CASE structure is that it can handle alternative values on the same line, provided they are separated by commas. It is important to close the CASE structure with END CASE. Note that all concluding structure lines need the END . . . as two separate words.

Changes to strings

Strings are altered somewhat by Comal – as I mentioned $. . . vanishes altogether. Strings are automatically dimensioned to be 40 characters in length, and strings of any greater length must be dimensioned using:

DIM name$ OF 60

The longest string variable can be 253 characters in length, presumably to maintain compatibility between normal string usage and disc read-writing. Whenever a string variable is used, its dimensioned length is allocated in the Comal variable space.

Unlike Basic, this string space does not increase as the string is increased in size. Instead, the memory remains constant until it would be exceeded, at which point a 'String Too Long' error message is issued.

Substrings

The INSTR function of Basic is available, but in a different form. The syntax is shown in the short routine below:

```
10 REPEAT
15   REPEAT
20     PRINT TAB( 5,5);
       "Ready? (Yes/No) ";
30     INPUT "":an$
35   UNTIL an$ > ""
40 UNTIL an$ IN "YESNO"
```

Comal also simulates LEFT$, RIGHT$ and MID$, but has much greater flexibility. If we set a$:= "ACORN USER", then:

```
PRINT a$(:5)     gives ACORN
PRINT a$(2:5)    gives CORN
PRINT a$(2:)     gives CORN
                       USER
PRINT a$(-4:)    gives USER
PRINT a$(:-7)    gives ACOR
PRINT a$(:-2)    gives ACORN
                       USE
PRINT a$(-5:-2) gives USE
PRINT a$(4:4)    gives R
PRINT a$ (4)     gives R
```

Notice that the last statement gives identical results to the previous one, but that the space between the a$ and the (4) is essential to prevent confusion with array variables. Substrings will operate with array variables too, so that:

```
sale$(4,5)="OLIVETTI"

PRINT sale$(4,5)(2:5)
gives      LIVE
```

It is also possible to insert substrings, for example:

```
a$="PORTSMOUTH"
a$(1:5)="DART"
PRINT a$
DARTMOUTH
```

Note, however, that you should not try to assign a substring longer than the space specified in the substring brackets.

Procedures and functions

Procedures in Comal are prefixed in definition with the word PROC. This procedure waits for a key passed as a parameter to be pressed:

```
 100 waitkey(13)

1000 PROC waitkey(char#)
     CLOSED
1010   WHILE GET <> char#
       DO NULL
1020 END PROC waitkey
```

Notice that the way of calling the procedure is simply by word. If we EDIT the program, line 100 becomes:

```
100 EXEC waitkey(13)
```

so we can tell that it is a call to a procedure. Notice, too, the way that the definition is concluded.

CLOSED is the way of explaining that all the variables in a procedure are LOCAL. If the GLOBAL variable 'recordnumber' was required in a CLOSED procedure it would have to be specified via:

```
IMPORT recordnumber
```

In Comal, it's possible to pass arrays to procedures by passing them by reference, eg, PROC sort(REF name$())

Functions are separated into string functions and numerical functions:

```
 10 a$:= getsetchars$
    ("YyNn")
 20 PRINT a$
 30 END
100 FUNC getsetchars$(c$)
    CLOSED
110   REPEAT
120     b$:=GET$
130   UNTIL b$ IN c$
140   RETURN b$
150 END FUNC getsetchars$
```

Notice how the function definition matches the procedure definitions, and the type of function is specified in the **$** which is postfixed to the function name. Unlike Basic, the value passed from the function is transmitted using RETURN rather than the '=' of Basic functions.

File handling

I could write a whole article on the file handling capabilities of Comal, so this section provides only a foretaste.

Comal supports up to five sequential files with a number of keywords:

OPEN FILE 1, diary, READ opens the file called 'diary' as file 1 to be read

OPEN FILE 2, courses, APPEND opens the file called 'courses' as file 2 to add records from its end

OPEN FILE 3, agenda, WRITE opens the file called 'agenda' as file 3 to add records from its beginning. Note that this option will not work with cassette.

Information is stored and retrieved from sequential files with the commands:

```
PRINT FILE 2:var1#,var2,var3$
```

and

```
READ FILE 1:a$,b#
```

File closure is important and requires a CLOSE FILE 1 or CLOSE FILE 2. The command CLOSE closes all files.

Comal handles random access files very easily. First the file is opened for update with the command:

```
OPEN FILE 1, progress, RANDOM
100
```

which opens the progress file, specifying 100 byte records. If we only require the facility to read the file we can specify:

```
OPEN FILE 1, progress, RANDOM
100 READ ONLY
```

"I cannot recommend strongly enough that Acorn include Comal in each BBC micro to promote better programming and prepare users for other languages which Acornsoft offers"

Reading and writing to the file can only be done to whole records, so typical commands might be:

```
PRINT FILE 1,recordno:record$
PRINT FILE 2,recordno:var#,var$
INPUT FILE 3,recordno:var1,
var2,var3
```

Both EXT and EOF from BBC Basic exist in Comal and are used in the normal way.

Timing

Comparing Basic and Comal for speed is essentially profitless, because as a Comal user you can always convert to Basic if necessary, providing you remember how to code the extra routines. For those interested the two following routines were compared using a BBC micro.

```
10 TIME := 0
20 FOR x# := 1 TO 1000 DO
   NULL
30 PRINT TIME
40 END
```

```
10TIME=0
20FOR X% = 1 TO 1000:NEXT
30PRINTTIME
40END
```

Comal executed in 0.48 seconds and the Basic equivalent in 0.18 seconds. Although we would therefore assume Comal is slower than BBC Basic, such a line of thought is less important when the rich structures available to Comal are taken into account.

Conclusions

First, what didn't I like about the implementation? The two main items were the lack of an assembler, plus its associated facilities, and equally importantly, the non-compatibility with Basic in terms of its internal representation.

It is possible that by producing Comal as a Basic extension ROM or as Basic issue 3, it would have a very large uptake from users wishing to upgrade to the latest version of Basic. This would have the side-effect of improving the status of Basic. As it stands, we know that BBC Basic can be improved, and Acorn must consider that improvement in the near future.

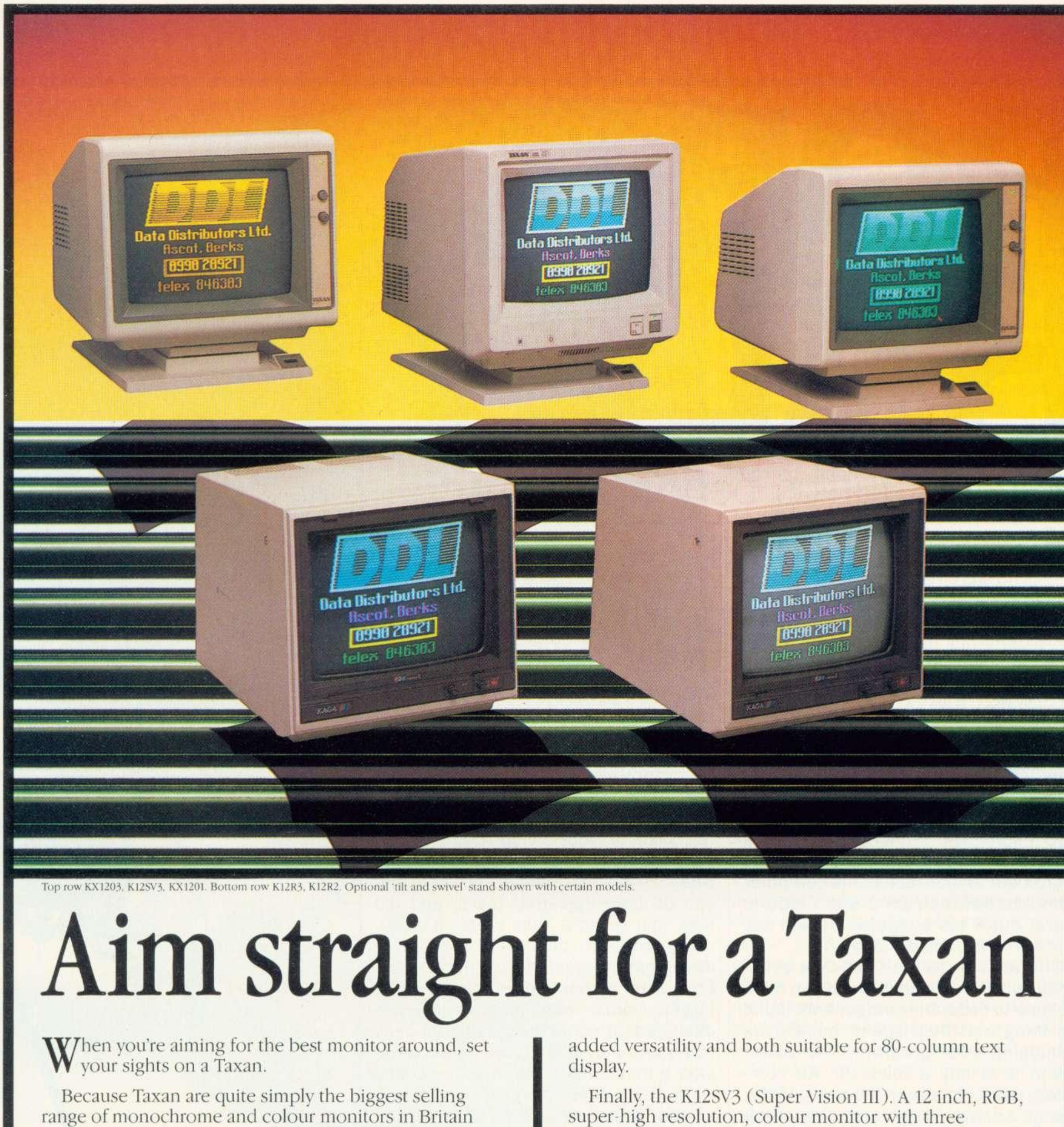
Other slight niggles include forced single statement lines, and forced clean structures. These comments are, I'm afraid, caused by my need to be only as structured as I want, leaping out of procedures by scattering ENDPROCs merrily around.

A couple of final complaints. There is a bug in INKEY$ which is patched in the book, and which is not a tremendous problem. Access to byte random access (BPUT BGET) is via a procedure invoking some machine routines. This is tedious, but works.

What did I like about the implementation? Well, everything else! The implementation is friendly, swift (certainly in comparison with Acornsoft Logo!), apparently free of major bugs, well documented, full of useful facilities which make Basic look old-fashioned, and it is easily learned.

Because Basic is supplied with each BBC micro it is in great use. I cannot recommend strongly enough that Acorn includes Comal in each machine, in order to promote better programming, and prepare users for other languages which Acornsoft offers.

In the meantime, readers can purchase Comal from their local distributor at a reasonable £49·85 including VAT. Extra manuals are available at £10 each.



Top row KX1203, K12SV3, KX1201. Bottom row K12R3, K12R2. Optional 'tilt and swivel' stand shown with certain models.

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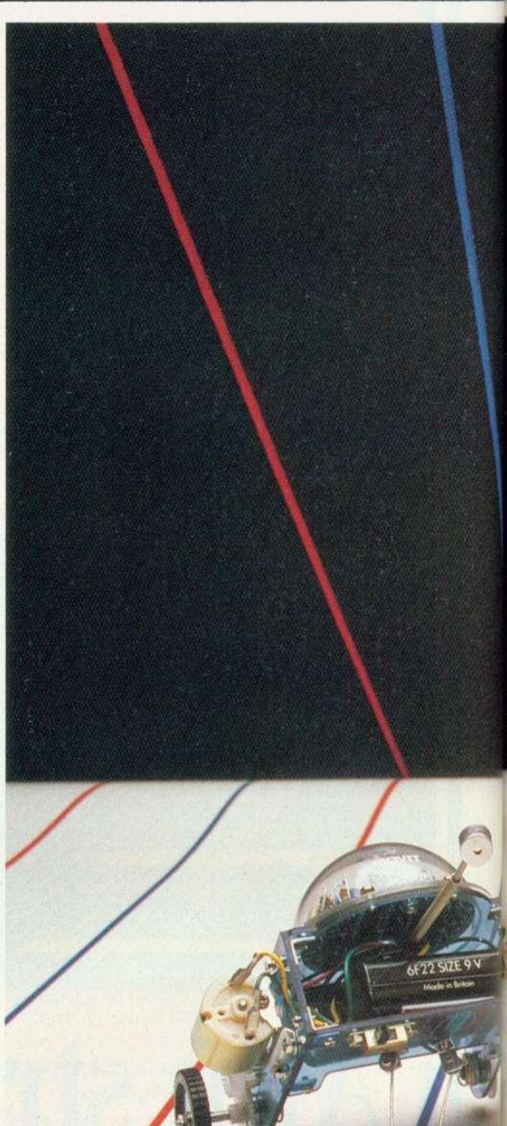
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ROBOT RALLY



Monkeys, turtles, beasties and buggies . . . Richard Sargent casts an eye over today's robotic hardware

IN 1981 there were a lot of good computers around, but only a few were affordable to individuals – the 2k Atom at £150 and the 1k ZX81 at £70 were the market leaders. The situation today with robot peripherals is very similar to those far-off days before the BBC micro was launched. There's a choice of robotic equipment for the micro user to interface to his computer if he has between £500 and £1000 to spare, but if his budget is limited the field narrows considerably.

One answer to the cash-flow problem lies in DIY, which is fine if you have the time to order the components, build the thing and then spend months on debugging your program. The better option is to buy a robot kit. Kit computers were popular in the early 1980s, and it seems likely that the same approach will get the ball rolling for robotics in 1985.

There are probably more robots available off the shelf to run on the BBC model B than for any other make of computer. One reason is the large number of B machines in schools, colleges, universities and research establishments, and manufacturers like to think these sources will maintain a healthy order book. The other reason centres on the ease of interfacing to the BBC micro.

The technicalities of interfacing are not particularly important to the user, unless he is an Electron-owner, in which case he will have to take into account the cost of the Plus 1 package, which provides sufficient output and input lines to drive most robots. However, if you have an expanded Electron, or a BBC model A, check with the supplier whether it will run the peripheral that interests you.

Robot arms

Preprogrammable arms are the workhorses of modern industry. Assuming you don't want Ultimate's Puma (£25,000) in your living-room, what's the next best thing? Robot arms for the Beeb fall into two categories: those that can do light industrial tasks, and the less sturdy type that perform accurately and can be used for program development, teaching and demonstration. The distinction is clear – the larger, more expensive arms are designed for continuous use on a daily basis and they have to be as accurate after a thousand hours of work as they were when first delivered. As for the smaller arms – well, they're fun to use and can be put to serious applications provided they're not given too much of a hammering.

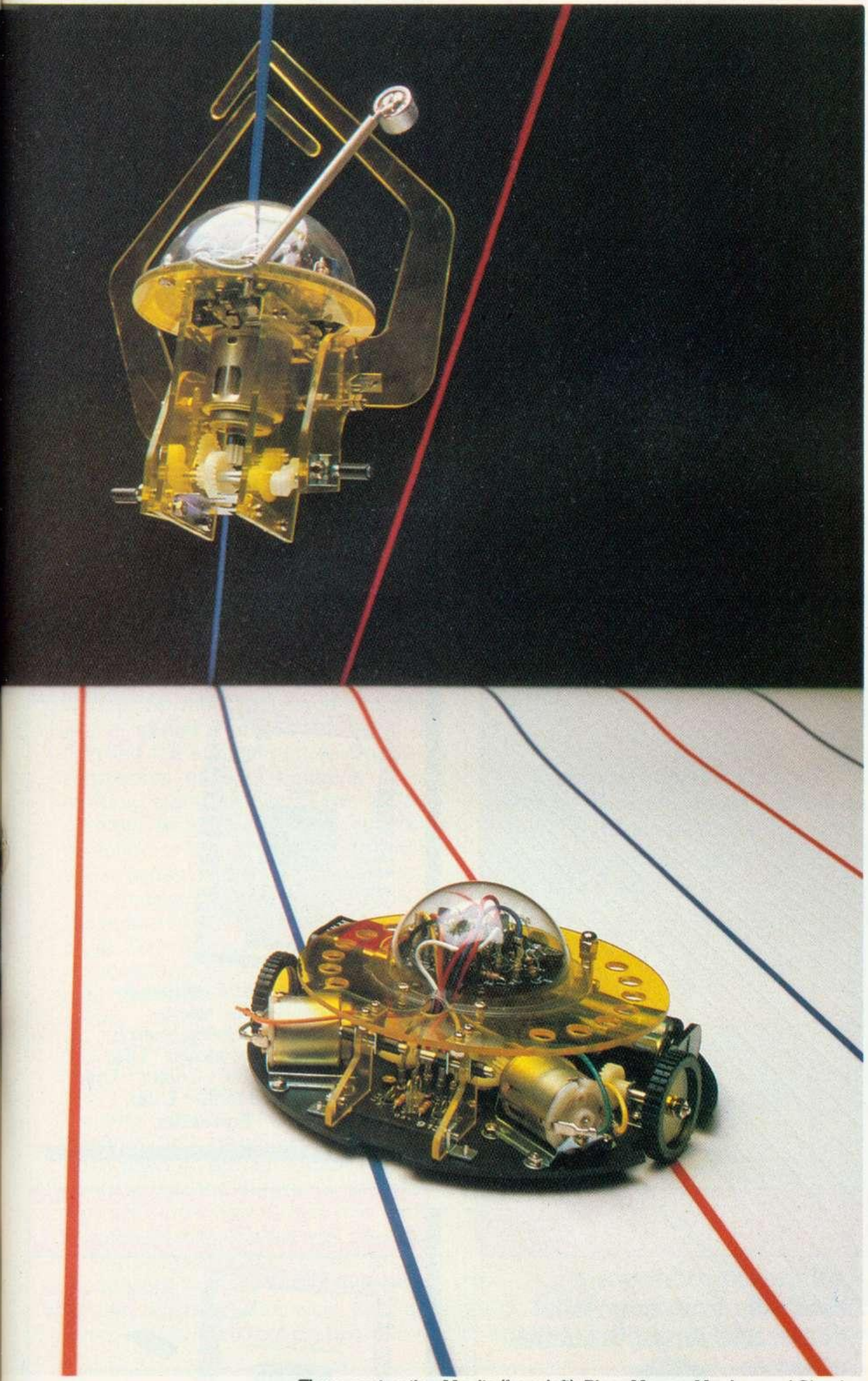
Arm robots usually have joints that mimic not just their human counterparts but the whole scope of human movement. The most versatile arms have five axes of movement: waist, shoulder, elbow, wrist-turn and wrist-rotate. A gripper of some sort – pincers or perhaps an electromagnet – may add a sixth moving axis, or a workpiece, such as a camera, may simply be bolted on to the wrist.

Armdroid 1 from Colne Robotics is a stepper-motor and pulley design that fits the bill, and similarly designed arms that also run happily on the BBC computer are manufactured by Cyber Robotics (Cyber 310), Powertran Cybernetics (Micrograsp), Cybernetic

page 75▶

WHIRLING DERVISHES

THERE are five Prism Movits, each with a different control mechanism and a different way of getting from A to B. Probably the most interesting to a computer-owner is the Memocon Crawler, the most expensive in the series and a dome-shaped affair controlled through a five-key pad con-



Three contrasting Movits (from left): Piper Mouse, Monkey and Circular

nected via a ribbon cable. Inside are 256 bytes of static RAM, in which a series of movement commands are keyed in from the keypad.

The Crawler has two motors and movement is like that of a tank – backwards or forwards by turning both wheels, left or right by rotating only one. It is equipped with buzzer and flashing LED, also programmable, and once the required instructions have been entered the key pad can be disconnected, after which it will obey your instructions until you turn it off.

Accuracy is not its strong point but then Movits are low-cost products and accuracy comes expensive. What makes the Crawler interesting is the relative ease with which it can be adapted for computer control. The control circuitry operates on standard TTL logic so taking off the keypad and interfacing the buggy to the BBC user port is relatively simple. Again, once it's programmed the control lines can be removed so that you don't have cables hanging all over the place and pulling the Crawler off course.

Second most expensive is the Circular, which again moves much like a tank. Using a small radio transmitter you can control the left and right wheels independently or together to move straight ahead or turn.

The appeal of the Circular lies in its movement. The two wheels completely encircle the unit and move independently of it, driven by two smaller internal wheels. From a distance the rotation of the external wheels is undetectable, so the overall effect is a sort of rocking, gliding movement.

The transmitter's range is only eight to ten feet, but in a normal-sized room you won't need much more and you can't really use it outside because it's fussy about the surface it runs on.

The Piper Mouse is a three-wheeler with an on-board sound sensor controlled by a small but ear-shattering whistle. The social desirability of such a device is doubtful but the whistle controls the Piper Mouse effectively enough by taking it through a repeating command cycle.

First command is forward, then each successive blast on the whistle makes it turn right, stop, turn left and finally stop, then the cycle starts again.

Next down the price scale is Line Tracer II. On the underside is a small infra-red sensor which detects a tonal edge and passes the information to the motor controller. When an edge is sensed one motor stops and the other starts, effectively changing direction until another edge is found. So, draw a thick black line on a large sheet of white paper, drop the Line Tracer on it and it will find and follow the line indefinitely.

Finally we have the Monkey, so-called because of its small, hooked arms, from which it can be hung from a length of cord. Any sharp noise is picked up by its microphone and it starts a jerky hand-over-hand movement along the cord for five or six seconds, after which it stops, waiting for another noise to set it going again.

And there we have it – five whirling dervishes, a beserk dog and a nervous cat crashing into each other on the floor. Despite their apparent sophistication they are still toys and, while they certainly have an educational value, they shouldn't be taken too seriously.

On the plus side they're cheap. Their modular design – most kits have at least one or two parts in common – suggests that without too much effort they could be combined in a number of ways to make some interesting creations. Above all, though, they're fun.

Kim Aldis

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TEN-IN-ONE

ROBOTICS and control engineering are rapidly becoming the fashionable subjects about which to be knowledgeable. Whereas a few years ago it was possible to be among the computer elite merely by having a BBC B it is now necessary for the machine to be hooked up to an array of exotic devices.

Robot arms and turtles – small floor mobiles – are being used in increasing numbers in schools but there are many other uses that demonstrate the computer's ability to control other machines. The problem is that most of these are expensive, and it's not until you've bought one and tried it that you find out whether you enjoy using it.

One solution is to build the machines yourself. German company Fischertechnik has recognised that and developed a kit, no. 30554, that will allow users to build a range of devices to show off the abilities of the Beeb. The kit is available through Economatics

The kit was developed in association with a German television company, which seems recently to have discovered the subject just as British TV companies have. It contains two dc motors, eight switches, two potentiometers, an electromagnet and a large selection of bits and pieces to enable you to construct a variety of models.

Fischertechnik will be well known to those who have used a BBC Buggy (see page 77), which is made from parts manufactured by this company, or have seen the BBC *Computers in Control* series which demonstrated many devices made from parts used in the kit.

To help get the novice started a booklet containing ten inspirational ideas is included in the package. At first it appears that insufficient instructions have been given but it soon becomes obvious that the diagrams have been worked out to convey the information required in the simplest way possible.

The designs of each model are well thought out, even down to the tidying up of the wires – and with the large number of connections there are plenty of wires trailing around. Indeed, you could be confused by the wiring as the colours of the wires provided don't agree with those illustrated. It's best to forget following colour codes and concentrate on making sure all the components are connected correctly.

Of the ten devices for which plans are included, the Teach-in arm is regarded as the most important. The claim that it is like those used in industry is an exaggeration, as it has only two degrees of freedom, whereas most industrial arms have more. However, with a base that can turn through 270 degrees and a retractable arm, it offers a simple simulation of what a bigger arm can do under computer control.

Other models for which plans are given include another arm, a plotter, a graphics board and a sorting system.

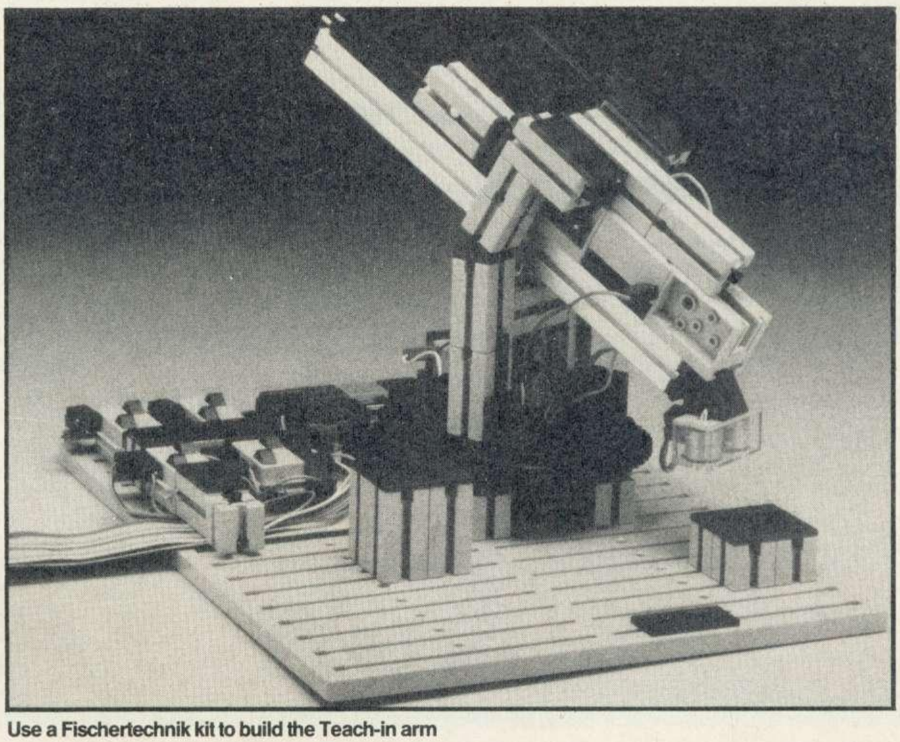
The kit costs £64.95, including VAT, but it is only a mechanical kit and needs an interface and software for the BBC B. There are three interfaces on the market at the moment, the Unilab at £49.95, the Economatic at £59.80 and Microrobotic Systems' at £59.80 (all prices include VAT). Microrobotic Systems is currently giving a special offer of free membership of the Amateur Robot Association to anyone buying both the kit and interface.

The Unilab, marketed by Commotion, is an easy-to-use interface with three programs, two specifically for the arm and plotter and a third that allows routines to be created for all the devices. Economatics supplies a similar interface with software that allows control of all the models.

Three programs are also supplied with the Microrobotic Systems version – one for the arms and plotter, another for the graphics board and the third for the solar tracker, which requires a solar cell (not supplied in the kit).

Overall, the kit provides a good introduction to control technology and robotics. It is limited in its scope, the potentiometers lacking accuracy and movement being in only two directions, one of which is circular. Nevertheless, it shows in outline what more sophisticated devices can do.

Nigel Clark



Use a Fischertechnik kit to build the Teach-in arm

◀ *Page 72*

Applications (Mentor) and Tecquipment International, which makes the MA2000 Open University robot arm.

Similarities between these four/five-axis arms are mainly confined to their general appearance. Some are supplied in kit form, some have an interface to the computer which costs an extra (and unexpected) sum of money, and some have specialised software running on Forth, Logo or on some other purpose-written robot language. You can expect to pay £300 to £700 for arms such as these.

Cost-cutting is achieved by reducing the number of powered joints or by introducing a greater number of plastic parts in the arm design. If the size of the motors is reduced and the strength of the arm whittled away, the carrying capacity drops from the 250 grams typical of the Armdroid class to about 75-100 grams.

The Beasty arm from Commotion has three powered joints giving it three degrees of freedom. The motors are lightweight servos borrowed from the world of radio-controlled models, and an optional fourth motor can be added to provide a gripper.

Competition for Commotion is provided by Robot City Technology, which sells the kit to make Alfred, the arm launched in a series of articles in

Page 77 ▶

THE BUGGY ADVANCES

THE BBC Buggy first caught the attention of the computing fraternity as a square two-wheeled crawler made by Fischertechnik that was seen to trundle around on the BBC TV programme *Making the Most of the Micro*. Since then some 5000 Buggies have been sold to schools, colleges and home users in the UK, providing a self-contained experience of robot applications.

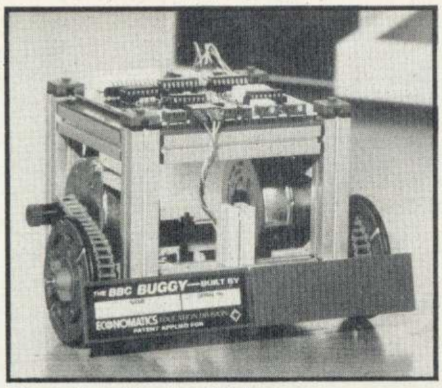
In the classroom the Buggy can add a practical dimension to any IT awareness course through the study of robot applications, as well as offering more specialist opportunities within computer studies or control technology courses.

As a robot the Buggy is a good deal simpler than some of the expensive multi-axis, high-precision industrial arms and mobile carriers that work in tandem in modern industry to reproduce intricate assembly operations day in, day out without complaint. Nonetheless, the Buggy was designed to demonstrate many of the fundamental principles behind these important giants of the robot world.

One of the major tests of any robotic device is whether it can perform 'real' tasks – perhaps not quite mowing the lawn or vacuuming the carpet, but a true robot should be something more than an electric trolley. It will be a tasking device, with characteristics that include programmability, reproducibility, ability to sense the environment and ability to make decisions.

The robot experimenter dwells in an environment which involves several areas of skill, yet the complex problem-solving, light-seeking, maze-solving or image-recognising computer program can present the ultimate challenge to the roboteur.

The BBC Buggy is supplied as a kit of Fischertechnik parts, a circuit board and interfacing, 13 application programs and thick applications handbook. The programs are designed to



Two motors drive the BBC Buggy

take the user from simple switching operations into more advanced ideas of decision-making and 'artificial intelligence'. Programs like *Memory Switch* demonstrate the ability of a robot to remember and reproduce tasks, *Sunseek* locates an object in an obstacle course, and *Bar Plan* allows the Buggy to take in route information from bar codes.

The Buggy can be moved along by sending pulses to two precision stepper-motors. The choice of this type of motor guarantees that the robot will always be where it is supposed to be.

Program 1 causes the Buggy to turn on its axis through 90 degrees. Substituting other values will cause different movements. Simple decision-making could be programmed by introducing the IF statement after the drive loop, so that we could encode such logic as 'IF left bumper hit THEN turn right'.

Two switched bumpers operate to detect a right or left collision. A light-dependent resistor provides simple 'vision', allowing the Buggy to navigate towards light-sources or to detect shadow areas. An infra-red opto switch provides a simple bar-code reading device, allowing the Buggy to receive instructions as it moves along or to follow a black (or white) line.

Two recent additions to the kit open a further door to exploration. One is the pen kit at £19.85 + VAT. This comes with some programs that include *Penedit*, a high-level wordprocessing approach to building application programs, rather like *Wordwise* to use. A list of commands may be rapidly built up so that the following would cause a square to be drawn:

```
PEN DOWN
  TIMES 4
    FORWARD 100
    RIGHT 90
  END TIMES
PEN UP
```

A grab arm kit (£79 + VAT) adds another range of possibilities. This attaches to the front of the Buggy to provide a grip-and-lift action. A separate board provides motor control. Tactile sense is cleverly provided by measuring motor-stall current through one of the analogue lines, so that the Buggy can detect whether it has successfully grabbed an object.

Possibilities for applications of the grab arm are substantially increased by the addition of light-sensors on each arm that can operate as 'eyes' in locating the position of objects, either by an increase in reflected light or by shadow-detection.

So we now have a robot capable of searching for an object, locating its position, knowing whether it has successfully grabbed it, and returning it to a given position. Such activity was science-fiction stuff some years ago, yet today this simple procedure perhaps sets a benchmark by which all emerging home robots need to be judged.

Mike Bostock

```
   10?&FE60=31 :REM 00011111
 0=out:1=in
   20port=&FE60
   40 direction=1 : pulse=(d
irection OR 2)
   60REM forward=0:backward=
5:left=4:right=1
   70count=1
   80REPEAT
   90?port=direction :PROCde
lay
  100?port=pulse :PROCdelay
  110count=count+1
  120UNTIL count=90
  130END
  140:
  150DEF PROCdelay
  160FOR D=1 TO 20:NEXTD
  170ENDPROC
```

Program 1. Turns the Buggy through 90 degrees on its axis. Other values may be substituted in line 120

◀ Page 75

Everyday Electronics. Like Beasty, Alfred uses servo motors for its motive power. It has five degrees of freedom and a powered gripper, resulting in the correspondingly higher price of around £200 for the kit and £270 assembled.

A kit in the more traditional sense is provided by the Fischertechnik kit no. 30554, available through Economatics. Fischer is already well-known as the supplier of the non-electrical bits of the BBC Buggy (of which more later), and its large construction kit has instructions for building 10 robots, including the Teach-in.

Interfaces for linking these models to the BBC computer are available from a number of suppliers and, depending on which one you buy, the total cost will be around £100.

The only other low-cost contender is the Armatron from Tomy Toys. This is a one-motor five-axis arm which, as a human-controlled toy, can be bought for less than £20. It can be put under computer control with some great difficulty, but an enterprising manufacturer has done the job for you, marketing the arm as the Memoco Electron arm at £150.

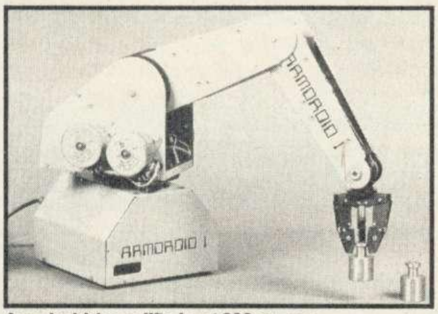
New arm robots are appearing or are being supplied with BBC computer interfaces every few weeks, and two worth looking out for are the Ogre 1

Page 78 ▶

◀ Page 77
from Staines & Co and the Teach Robot from Remcon. Both are mid-price robots with interesting features – Ogre has only three axes but will lift 1000 grams, while Teach Robot is a fast-moving arm with the full five degrees of freedom. And, if you are handy with a soldering iron and are prepared to tackle the software yourself, just about any robot can be converted to run on the BBC B.

Robots on wheels

Mobile robots are more appealing than arms. Indeed, some manufacturers would have us believe that they are electronic pets. Does your BBC/Electron want a little friend...? It might already have the little Zeaker, or a BBC Buggy. The BBC Buggy is still going strong after two years, and has recently acquired a grasp that can be fitted to its leading edge – handy for nipping people's ankles and for more serious uses. Zeaker has had a chequered career, but was reborn in the shape of Zero 2, a



Armdroid 1 can lift about 300 grams

cleverly designed turtle in the sub-£100 price bracket. Both the Buggy (from Economatics) and Zero (from Intergalactic Robots) use stepper-motors for high-precision movement.

Turtles and buggies are invariably tied to the language Logo, which has gained great popularity as an educational tool. Logo was conceived as a programming language for children and its use with floor turtles allows geometry to be understood more easily (and even appreciated), helps develop logical thinking and teaches structured programming without tears.

The mobiles that draw lines are best controlled using Logo and you should check that the one you intend to purchase will run on the version of Logo you already have. The BBC Buggy has a list price of £189, although schools often buy them at half that figure under the MEP scheme. It comes with 13 programs, one of which, *Snail*, is very close to Logo. Zero 2, when bundled together with Logotron's Logo and a power supply, comes in at £150.

Turtles often tangle themselves up in their own umbilical cord, and cordless robots (which need their own battery power packs) are beginning to appear. Zero 2 has infra-red control as an optional extra, as does the massive caterpillar-tracked Beasty Base, but the Valiant turtle from Valiant Designs was conceived as cordless.

The RC4 Turtle from Jessop Microelecronics goes one stage further and boasts two-way radio contact with the micro's Logo. Radio waves pass through onlookers' bodies whereas infra-red waves do not, so maybe the outcome of the battle between radio and infra-red is a foregone conclusion.

Whatever the type, cordless buggies tend to cost about £200, and the search for a low-cost mobile is not an easy one. The best option is to buy one of the excellent Japanese Movits kits – specifically the Line Tracer at £18 – and the Movit interface made by Dew Electronics at £25. The Movit won't trundle with millimeter precision and doesn't, in its present form, draw lines, but the accompanying Basic and machine code programs are instructive and the package represents a good introduction to turtles at a rock-bottom price.

No overview of robotic peripherals would be complete without mention of robot vision. Mobile robots and arm robots work more reliably if they can 'peer' at their surroundings and if they have a program that helps them to make sense of what they see. If we discount the vision systems which use cathode-ray tube cameras (try mounting one of them on a small robot arm!), there isn't much available for the BBC micro. Fortunately, there is at least one and a very good one at that. This is the Snap/EV1, a lightweight miniature solid-state camera backed up by a suite of programs which includes pattern recognition, movement detection, animation and art, and printer routines.

Snap is made by Micro-Robotics and marketed by Commotion at £113 plus VAT. Seeing is believing, and I can think of no better introduction to robotics than experimenting with computer vision. Of course, you'll need a robot arm and a mobile base to carry it.

So, now you have your robot, what do you do with it? A robot doesn't necessarily start life as a toy, slave, pet or teacher. Like the early computers, conceived as educational tools in the broadest sense, their use is not limited to education and they can be programmed to do tasks that their makers never dreamed of. Remember, though, that the robots of today are just a foretaste of what is to come, and that in ivory towers here and abroad a lot of heavy thinking and quite a few million pounds, dollars and yen are being poured into research in the field of artificial intelligence and robotics.

THE BEAUTY OF THE BEAST

DESPITE the growing popularity of home robotics, it is hard to find a cheap way to build a home system that can do anything useful. But Commotion markets a range of software and hardware to refute this generalisation.

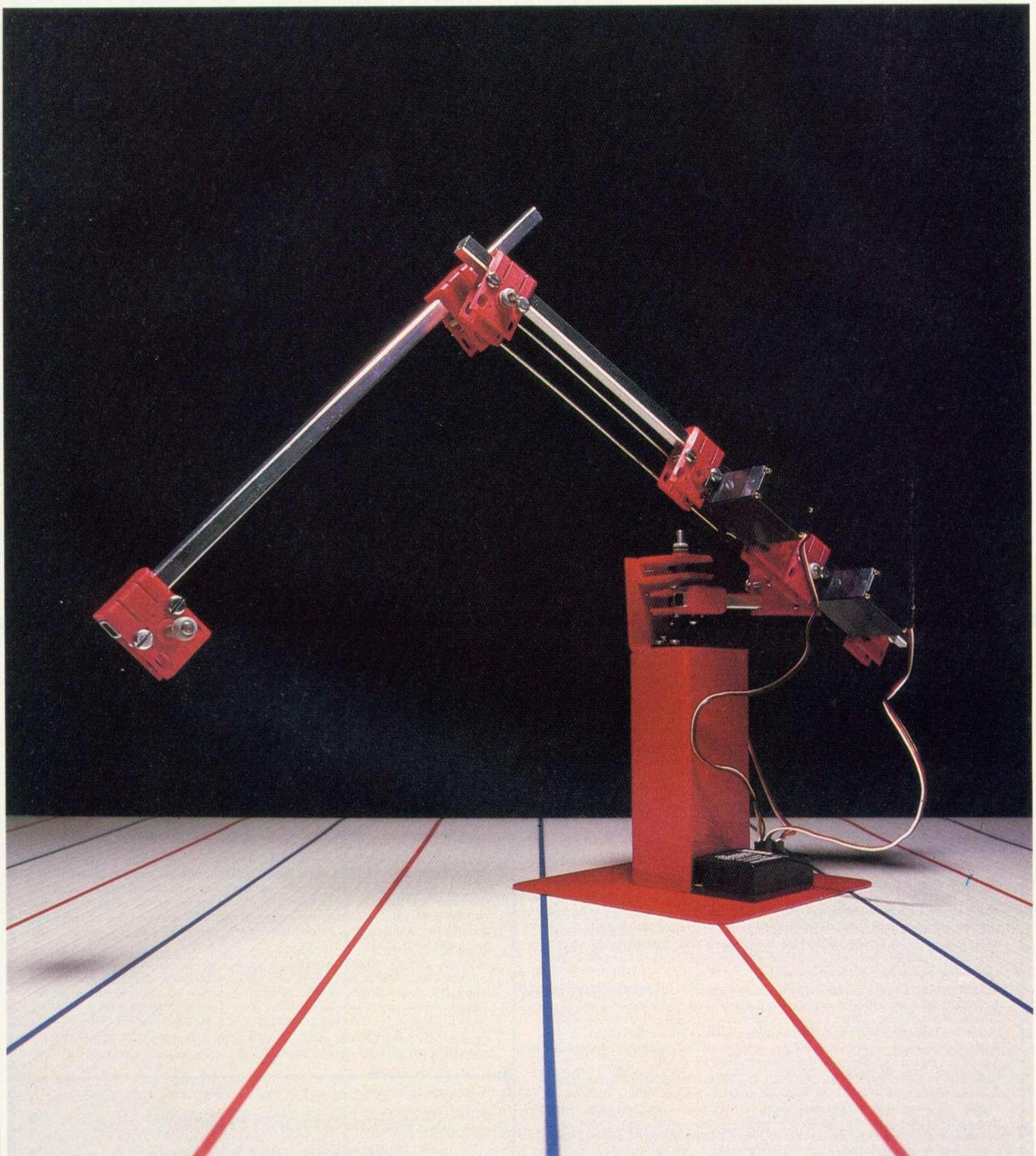
The key to the whole range is the Beasty interface, which allows for the control of up to eight servo motors, using a BBC, Commodore or Sinclair Spectrum micro. The servo motors are imported from Japan and range in price and power from a P-S128 at £13.04, with a torque of 3.5kg/cm, to the P-S102 which costs £150, delivers 75kg/cm and is designed for industrial users.

The Beasty can be linked to the servos by either cable or infra-red transmitter. True inventors will immediately think of applications. In addition to controlling servo motors, which can be positioned to turn switches on and off, to open windows or control model cars, the Beasty interface can be used to control any device with an infra-red receiver. Peter Miller of Commotion demonstrates this on his television and hi-fi equipment.

However, to get the rest of us started, Commotion offers the Beasty robot arm, a three-axis device incorporating three servos and a Beasty interface, to which a fourth servo and a gripper may be added. This starter pack costs £125, together with all the software required to drive the system.

In terms of drivers, Peter Miller provides his own control language written in Basic. This owes a good deal to Logo in its structure and allows the user to write modular procedures, which can then be combined to set the arm to work. Alternatively, one can use a special extension to Logotron Logo, with primitives built into the language.

This provides far greater flexibility in programming, as one has all the control structures of a full programming language, including the passing of variables and tests of the IF ... THEN variety. This doesn't simply open up a new dimension in school robotics; it makes it extremely easy to build a flexible control system for a greenhouse, for industrial equipment or for domestic appliances. It would be possible, for example, to ease greatly the life of a bedridden person, switching lights on and off, opening and closing curtains and turning the page of a book on a reading stand. Such a system would be within the capability of a reasonably



The Beasty could bring out the Heath Robinson in you

handy person to install. By far the most expensive element in the system would be the BBC micro itself, but if I were bedridden I would like one of those to play with anyway.

To operate the system completely automatically under program control, with the curtains being closed at a given time of day, and the television switching itself on for the news at 9pm, you can't play with the computer too.

The infra-red receiver is linked by wire to the various devices and has controlled devices at up to 100 metres from the computer, which is plenty for most home or industrial applications. They are quite compulsive gadgets, and once you see one there seem to be no end of uses to which they can be put, and one quickly feels the need for more than eight channels. They also engender a Heath Robinson state of mind as the servo motors physically switch switches and lift lids.

What are the disadvantages? Well, the Beasty arm is not a full-featured factory robot. It is, if you like, an educational toy, with a number of practical uses in the right hands. The questions are: Do you have devices you frequently need to control across the room? Can you justify buying a microcomputer for this purpose? If the answer is yes on both counts, you can probably do it with a Beasty.

Christopher Roper

Microdis

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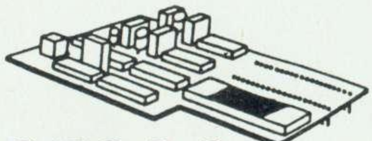
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Economatics (Education), 4 Orgreve Crescent, Dore House Industrial Estate, Handsworth, Sheffield S13 9NQ.

Zero 2 £99.95 inc VAT (assembled)
£79.95 inc VAT (kit)
InterGalactic Robots, Unit 208, Highbury Workshops, 22 Highbury Grove, London N5 2EE. Tel: 01-359 2536.

RC4 Turtle £175 + VAT
Jessop Microelectronics, Unit 5, 7 Long Street, London E2 8HN. Tel: 01-739 3232.

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Teach Robot £448 + VAT
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Alfred £270 + VAT (assembled), £200 + VAT (kit)
Robot City Technology, 20 Burners Lane, Kiln Farm, Milton Keynes MK11 3AU.

Ogre 1 £240 + VAT (assembled), £195 + VAT (kit)
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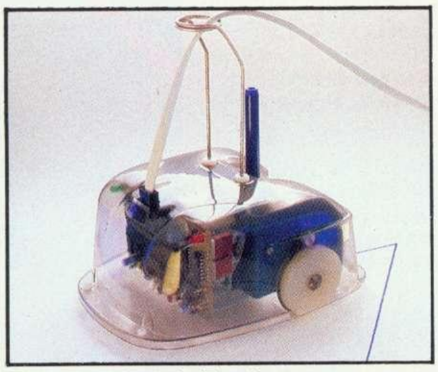
Open University Robot £3,633 + VAT
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Valiant Turtle £199.95 inc VAT
Valiant Designs, Unit 14, Park House, 140 Battersea Park Road, London SW11.

COUNT ON ZERO

ZERO 2 from InterGalactic Robots is a small robotic device equipped with wheels, pen, lights, line follower and two-tone horn, which is controlled by signals through a cable from the computer. It connects easily to most personal computers via the serial port, and is capable of precision movement in forward, backward or turning motions to accuracies of 1mm or one degree, which enables programs to be written to instruct the turtle to draw a trail of complex shapes accurately (usually through the high level language, Logo). It can be equipped with a bump sensor, so the computer program is informed that the robot has met an obstacle and can issue commands to avoid the obstruction.

Developments are under way to give Zero 2 many more abilities. It has an on-board expansion connector that will allow up to two other printed circuit boards to be plugged in within the shell,



Sounding its horn: the Zero 2

or more if the shell is discarded. At the moment this allows the bump sensor to be added and hole edge sensing (so that it doesn't fall off the table!).

Zero 2 is primarily intended for three markets:

1. Domestic – for the continuation and expansion of educational contact at school; for education at home where it is not available at school; and for personal recreation and experimentation.
2. Schools – for teaching interaction with the computer and logical thinking; and providing a focus for programming projects.
3. Technical Colleges – for teaching control theory; robotics; and providing a mechanical base for experimental, electrical design projects and advanced programming.

Zero 2 in its primary mode has a number of built-in functions; that of drawing Logo graphics, with LEDs to be turned on and off, a two-tone horn that can be sounded and a line-follower. Add-on boards provide speech, obstacle detection and hole sensing.

It is 180mm long, 150mm wide and 90mm high with a transparent shell and baseplate – a feature essential to Turtle Microrobots used in Logo programming, where viewing of partially completed patterns is desirable.

The machine is driven by two steppermotors, each controlling a wheel in half millimetre steps. The pen is raised or lowered by a third stepper motor, and these three motors and the pen-lift mechanism are mounted on a rigid aluminium framework, a 'pelvis' which, in turn, is mounted on the transparent baseplate. Towards the front of the baseplate there is a nylon glide, or toe, to prevent Zero 2 from falling over. All the electronics are mounted on a 100mm by 65mm printed circuit board which is, in turn, fastened to the pelvis.

At the top of the PCB is the PCC socket (similar to a telephone connector socket but with a different polarisation) to take the power and control umbilical. All the works are protected by the easily removable cover. In 'buggy mode' this can be left off. The umbilical is held clear of the pen by the wire loop halo which plugs into the top of the body.

Zero 2 is independent of the make of computer used to drive it, but the lead from the computer to the robot is computer-dependent. Zero 2 has been launched with three leads; for the ZX Spectrum, Commodore 64 and BBC micro. RS232C (25 pin), Amstrad and Atari leads are planned for the near future.

The PCB is packed with components, and so is supplied as a ready-assembled and tested item for the kit version, and the leads to the three motors and the speaker plug on to this. (Having the circuitry ready-built in this way should be seen as similar to buying an integrated circuit as opposed to trying. to make an equivalent circuit from discrete components.)

One of the problems with umbilical controlled vehicles is the umbilical itself – an infra-red communications link will shortly be available. For the vehicle end, there will be a backpack containing a rechargeable battery and an infra-red receiver/transmitter unit with a complementary infra-red unit at the computer end.

Another add-on board will be a programmable speech system which will plug on to the Expansion Bus connector. Other add-on boards are to include one for detecting obstacles in Zero 2's path and another for detecting holes, edges of tables or simply a coloured border round Zero 2's territory to prevent it straying.

Page 83 ▶

INTER-SHEET

The electronic spreadsheet program

Spreadsheet programs have become one of the most popular micro-computer applications in recent years. They can be thought of as a totally general purpose numeric tool, of use to anyone who has to handle figures, calculate costings, keep control of running costs, or just simple budgeting.

This package contains the ROM itself, a quick reference card, an introductory manual to spreadsheets and a comprehensive reference manual. Chip fitting instructions and a function key strip are also included.

The program has many quite unique features.

1) 40, 80 or 105 column screen display. The special 105 character screen mode displays more than any other spreadsheet.

2) Up to 16 spreadsheets may be stored in memory at once.

3) Data can be transferred from one spreadsheet to another.

4) Spreadsheet data can be transferred to and from popular wordprocessors such as WORDWISE and VIEW.

5) This package will integrate directly with other ROM-LINK compatible products, such as INTER-CHART, which can produce charts and graphs of data from the sheet.

6) Formulae in boxes are tokenised to save space. This means larger than normal spreadsheets can be accommodated.

7) Main menu enables even the inexperienced user to operate the more complex functions. There is no need to remember long command names.

These are in addition to many other powerful features such as: Variable column widths. Flexible replication facilities. Insert and delete rows and columns. Numbers may be printed in three formats. The number of decimal places is variable from 0 (integer) to 9.

Locking/unlocking of boxes. Boxes may be justified left or right for numbers and left, centre or right for labels.

Most of the above features can affect individual boxes, rows, columns or the entire sheet.

INTER-SHEET supports a large range of high precision mathematical functions. These include all the more common functions such as SIN, SQR, TAN etc. but also include special sheet functions like SUM, MAX, MIN, LOOKUP, AVERAGE.

A special form of windowing has been included allowing any row or column to be held on screen as the sheet scrolls underneath.

All in all these features go to make INTER-SHEET the most powerful and flexible ROM based spreadsheet available for the BBC Micro-computer.

£49.00 + VAT (£56.35)





ROM-LINK

INTER-SHEET is the first of a fully integrated suite of ROMs for the BBC MICRO to be known as the ROM-LINK series. Any ROM-LINK compatible product can run in memory with other ROM-LINK programs, and data can be transferred directly from one to another.

ROM-LINK

Computer Concepts

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Controlling Zero 2 is easy to do even from Basic, but to follow a line or detect obstacles, bitwise comparison is needed and some versions of Basic do not support this. In these cases it is necessary to write a routine in machine code. Such sets of routines are available for the Commodore, BBC micro and Spectrum, either to interface to Logo or to be called from Basic. These are supplied with the robot.

Zero 2 sells in kit form for £79.95 and assembled for £99.95.

Agreements have been signed with Sinclair Research and Logotron to distribute Zero 2 bundled with Sinclair's version of Logo software for the Spectrum, and Logotron's implementation for the BBC micro. The bundled price for the Sinclair Logo version is £129.95 and for Logotron's, £149.95.

Maplin, the electronics hobbyist distributors, have signed an exclusive agreement to market Zero 2 in kit form, which will be available through their stores and catalogue.

Most people, when they see a robot like Zero 2, ask one question: 'What can I do with it?' Here are a number of applications that InterGalactic Robots have considered, some of which may be developed by them, or others, during the next few months.

Follow-my-leader The leader lays a thick black line using a fat pen on a large sheet of paper, the others follow. The leader loops-the-loop to try to get the followers to lose the trail. The leader has a head start but cannot move quite as fast as the pursuers, who win if they touch the leader. Note, the leader is under direct control, the followers under program control.

Dice, roller and games counter mover For trapping, moving or rolling using the pen attachment. Penup releases the counter or dice, and pendown traps. Movement of Zero 2 either rolls dice or simply takes a counter to another position. Note that the computer can memorise a large number of positions, so it can return to roll dice, or move counter/marker to another position, hours later in a game.

Broom Sweeps up crumbs on the table! When you have learnt to do it by direct control, write a program which makes the turtle do it by itself. As it can't see the crumbs, it has to repeat each action several times to ensure none are left behind.

Water plants while you are on holiday A water bottle and thin tube is arranged so that Zero 2 can open and close a small tap at the end, using the penup mechanism. The bottle is hung from a hook on the wall, and Zero 2 carries the fine tube from plant to plant every x hours and waters for y seconds.

Play the organ Zero 2 moves up and down the keyboard playing a simple jazz riff or other accompaniment (using a finger sticking sideways from the penup), while you play the solo part!

Play with the Baby Rock the cradle, provided it is hanging, pivoted or a springy pram, by a simple program which moves Zero 2 back and forth at a speed you adjust until you catch the natural harmonic of the cradle.

Teaching robotics Collision avoidance and route finding. Draw a room and some furniture in thick lines. Park one side ("HOME") and the student has to write a program to get to a given point, avoiding any obstacle Zero 2 comes across. You can do the same for a program to cover the floor area as if mowing a lawn or vacuum-cleaning a carpet, etc.

Maths teaching Draw a number line, then add and subtract visually, even carry out small-number multiplication visually.

Teach Modulo arithmetic by drawing a circle, then going round adding or subtracting, and even small-number multiplication.

Estimating – a whole class can sit round as Zero 2 draws a line. How long is it? (Zero 2 knows precisely). All the class's estimates can be entered into a computer for mean and standard deviation (if you want), and/or the closest guess is the winner. Zero 2 could even go and point to the winner!

You can do the same thing with a square, triangle, star, bottle shape, free shape, etc, asking for estimates of the length, angles, areas, or whatever you like (Zero 2 always knows the exact answer and can pick the best estimate). Now get Zero 2 to start shapes, and the class has to guess such things as how many sided it will be, the radius if it is a circle. More advanced stuff? Where exactly did an arc of curvature x end and a different curve begin? What is the area beneath a sine wave?

Teaching Spelling A line of capital letters (drawn by Zero 2?) similar to the number line. Zero 2 can move up and down it, pointing to any letter (possibly using an accessory pointer). It stops and hoots at each letter. Who is the first to guess the word or sentence Zero 2 is trying to 'say'? You can adjust the level of speed, duration of stop and level of words. Also there is an option to reset the position at any time in case it slips (or is pushed!).

Robin Bradbeer

JARGON BOX

Artificial Intelligence (AI) – computer programs that can be built-up. They perform tasks requiring intelligence when done by humans.

Expansion Connector – socket that allows the user to add to or expand the system.

Hardware – physical components of a system, eg, the computer, the robot, the disc drives, the printer, etc.

Interface – connection boundary between two items of hardware.

Infra-red – invisible 'light' at the red end of the spectrum.

Jargon Box – list of terms used within an article or articles with brief explanations. Often written by over-worked Technical Editors.

LED (Light Emitting Diode) – small electrical devices that emit light when energised.

Opto switch – switch that is actuated by light, darkness or infra-red light.

PCB – Printed Circuit Board, used to hold electronic components and their inter-connecting tracks.

Peripherals – external devices that plug in to the micro.

Ribbon cable – multi-wired cable in the form of a ribbon.

Robot – programmable mechanical device that normally has arms and sensors.

Robotics – discipline that ranges across mechanical engineering and artificial intelligence, giving rise to robots.

Serial Port – the RS423 Port that allows data to be transmitted one bit at a time along a single line.

Sensor – an electronic device that is capable of 'sensing' a predefined condition, eg, a black line, an obstacle, etc.

Software – program.

Stepper Motor – motor that moves in single discrete steps when a voltage is applied.

TTL (Transistor Transistor Logic) – a popular family of logic circuits used in ICs (integrated circuits).

Turtle – roving robot device used in Logo programming.

Umbilical – lead used to connect the robot to the computer or control mechanism that allows remote operation.

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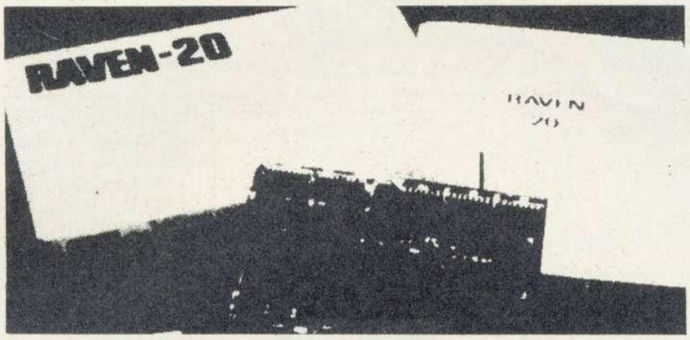
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▲

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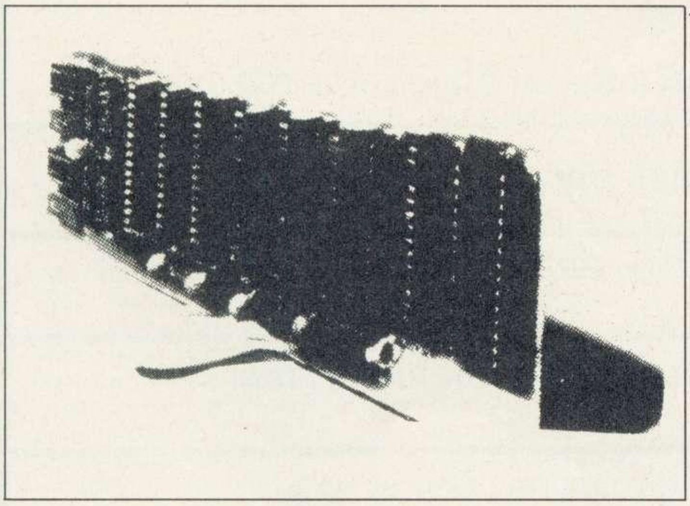
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RON – Enable RAVEN-20 in SLOW Mode
FRON – Enable RAVEN-20 in FAST Mode
RVFF – Disable RAVEN-20
RTEST – TEST RAVEN-20 RAM
RSTAT – Show status of RAVEN-20
SSAVE – Save Screen to file
RAM – Sideways RAM load
RZAP – Examine/Alter BBC RAM
RVZAP – Examine/Alter RAVEN-20 RAM
RPAGE – Set/Show RAVEN-20 work page (fast mode)

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◀ RAM-ROM BOARD

The RAM-ROM extension board gives an extra 6 sockets for extra ROM's and 2 slots of RAM. This RAM is not an extension of BASIC. It is intended that the RAM be used to develop your own ROM based software. There are in fact seven sockets on the board, the 7th replaces the socket on the main board that would otherwise be taken by the ROM board. (The RAM-ROM board can accommodate both 2764 type EPROMS as well as 27128 EPROMS and ROM).

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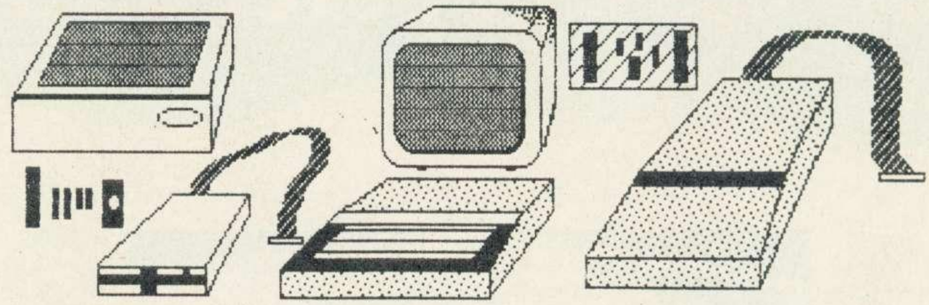
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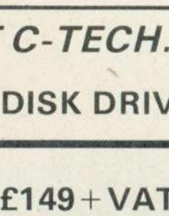
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SCROLL ON

Jeff Tullin's Bulletin Board will help get your message across

THIS PROGRAM came about as the result of a request by a friend for a program for a personalised shop window display for his computer stock. He felt passers-by were unlikely to look twice at a lifeless row of computers mutely proclaiming:

BBC Computer 32K
BASIC

for hours on end. Ideally he wanted something colourful, and preferably animated, to catch the eye of potential customers.

A further consideration was that it should be fairly easy to customise from time to time in order that special offers and the like could be advertised with the minimum of fuss.

Bulletin Board is a simplified version of the program I came up with. It is designed around those scrolling red LED displays beloved by newsagents and the like, and displays messages on the screen in gigantic moving letters.

The text to be displayed is passed to the machine code section via a Basic procedure (PROCnotice_board). It's easy to customise because to change the message it's only necessary for the user to alter those lines which call PROCnotice_board.

The maximum number of characters that can be passed at any one time is 255. As the demonstration program shows, this need not be a restriction, because once one message is finished, you can just call the notice_board procedure again with a different string parameter, giving the illusion of a continuous stream of text.

The routines dealing with the scrolling and the expansion of letters are kept quite separate in the assembly language section, and I will outline how they work in a similar manner.

The subroutine SCROLL works within a predefined window, shifting the contents one space to the left each time it is called. Acorn would have us use its operating system routines for all output to the screen, but I must confess I found it easier to understand, and faster in operation, to address the mode 7 screen directly for this routine.

Unfortunately, if the display has previously scrolled, due to text reaching the bottom of the screen, the top left-hand corner of the screen is no longer location &7C00. Therefore, the screen must be cleared by a CLS or mode change before the code is called. The first line of PROCassemble holds data about the 'window' which is to be scrolled. I have deliberately set this out in the same form as the standard VDU28 text window command, so that it is easy to alter.

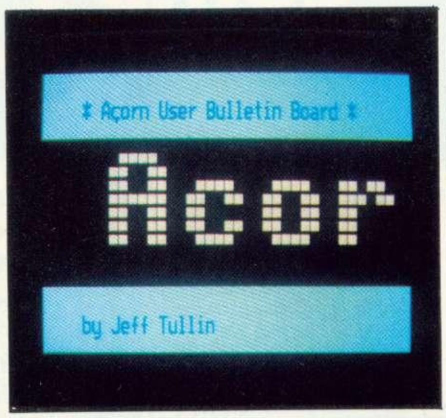
Starting at the top left of the window, one whole line of characters is shunted one space to the left. The working addresses in zero page are then incremented by 40, and the same action is carried out on the next line. This continues until the whole of the area has been moved. Following this the routine exits.

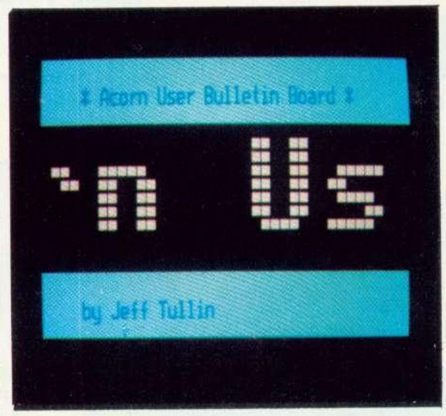
The routine BIG examines each letter in turn of the string passed in PROCnotice_board. An OSWORD call with the accumulator set to &0A creates a look-up table of bytes which represent the dot-pattern of each letter. The resultant eight bytes are dumped into the space following the label 'info' in the listing. The cursor is then TABbed to the top right of our window, and eight vertical rows of blocks are sprayed onto the screen.

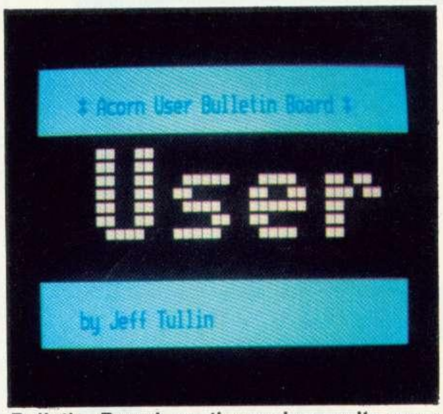
Each is followed by a call to the scrolling routine. The routine 'delay' introduces a small delay between rows, so the letters do not scroll over the screen at too high a speed. This is achieved by accessing the system clock with calls first to OSWORD with A = 2 (set system clock) and A = 1 (read system clock). The loop labelled 'delay' waits until location &D00 holds the value 1.

Different speeds can be achieved by altering the number after the mnemonic CMP# – I found the value 1 to give the smoothest scroll. Even so, on occasion, I have found that the letters seem to shimmer as they move. This is because they get out of sync with the television display. The only cure I have found for this is to re-run the program, as it seems to rarely occur twice in a row.

Line 1560 controls the actual block character printed in rows on the screen. The program will run on tape or







Bulletin Board continuously scrolls your message across the screen

disc systems without modification, although some of the routines use a little workspace in PAGE &D00. This should be changed if you already have some other use for that area.

Finally, some good effects can be obtained by altering this line to LDA# <some other value> – it is set to LDA# ASC"@" in the listing. It can be great fun having the letters made up of dozens of asterisks or arrows. You may wish to try adding an interrupt-driven musical sound-track to the proceedings.

Shopkeeper or not, it's a great way of getting your message across!

See yellow pages 98–99 for the Bulletin Board listing plus a breakdown of variables and procedures

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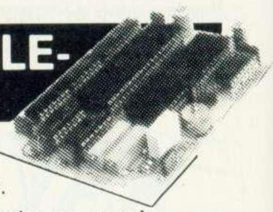
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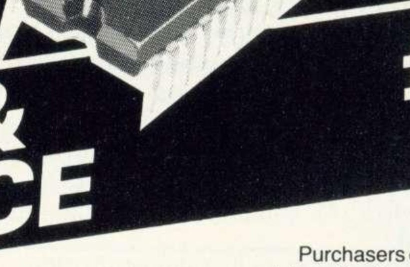
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SWEET SIXTEEN

February's winners

FEBRUARY'S competition about the dials attracted a huge entry – nearly 1000 – and about 75 per cent were correct. The answer was that Player 1 obtained 8095 dials showing orange and Player 2 precisely zero. As several of you pointed out, the first figure required some brute force programming, the second could be worked out by some logical reasoning.

The winners of the Silver-Reed printers were M J Livesey of Torquay and Mrs S D Hook of Northampton.

IN THE 16 × 16 matrix in figure 1 you must add 16 numbers – one from each column. You can start with any number you like in the left-hand column and work your way through to the right-hand column. At each stage you can move up or down one row (provided you don't move off the matrix), or remain in the same row. For example: suppose you start at 912 in the first column, you can now add 781, 416 or 251. If you choose 781 the next number to add can be 234 or 938; if you opt for 416, you take your pick from 234, 938 or 605. Your objective is to form the highest total possible following these rules. What is it?

Answers, together with the 16 numbers you choose, on a postcard or back of an envelope please, to arrive not later than Friday 5 July. Please address your entries to June Competition, *Acorn User*, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

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912	416	938	790	753	488	329	384	537	447	449	651	937	967	175	468
462	251	605	916	352	552	236	593	792	673	754	428	658	390	138	194
765	430	676	572	761	761	766	745	440	269	427	881	476	529	333	757
654	970	742	231	376	990	763	859	416	148	542	963	551	917	751	318
449	333	945	992	749	271	283	389	866	868	224	333	575	103	543	599
428	374	671	428	332	841	394	798	941	384	260	581	232	575	943	450
966	311	305	862	770	390	758	888	467	756	992	190	732	285	783	340
584	686	637	871	696	993	621	910	270	481	403	466	879	724	658	215
272	145	219	492	736	496	893	127	665	256	921	856	734	999	975	657
306	608	637	123	368	653	932	934	166	602	401	190	373	231	617	361
939	884	749	388	332	886	334	329	503	262	586	431	329	585	380	470
182	572	689	235	483	686	770	437	962	697	467	874	495	380	455	422
705	876	258	140	686	937	611	994	455	731	639	569	686	930	119	438
107	831	927	742	400	696	406	777	133	170	562	758	880	827	272	461
603	157	570	743	251	242	741	648	439	361	440	476	942	290	342	899

BACK ISSUES!

1. July/August 1982 The first issue. Articles on drawing techniques. The BBC Computer Programme. Machine code graphics. Questions & answers. Hints and Tips. Sound. Interfacing scientific instruments. Dumb Terminals for 0.1 machines. Disc drives. Econet in schools.

2. September Ceefax telesoftware. Beeb in business. Mailing list. Simple files. 30-Hour Basic course. Art on a micro. Music. BBC micro as a key-



board. Extra Atom commands. BBC Basic board. ULA design. Teletext graphics. Machine code graphics. Analogue input. Schools training. 0.1 cassette bug patch.

3. October Electron details. BBC TV series – confessions. Two Epson graphics dumps. Seikosha GP100 dump. Worldwide networking for BBC micro. Garbage handling. Voice ROMs. Sound pitch envelope. Moving graphics. ZX printer for Atom. RGB colour separations for Atom. Biofeedback. Book reviews.

4. November Teletext. Second BBC TV series. Machine code series 1. Programming forum. *Trek III*. Speeding up graphics. Bomber game listing. 7-tone Epson graphics dump. Atom graphics manipulation. Dumb terminal for 0.1 machine. Firework graphics. Editing tips.

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5. December BBC TV in schools. Machine code 2 – registers. Programming forum. Program generators. Carols. Hints & Tips. Logo and Turtle graphics in schools. Introduction to procedures. Software review. Atom word processing. Toolbox review. 16-colour graphics on model A. Sorting. Sound envelope design.

6. January 1983 MEP school launch. *FX commands for sound. Second BBC TV series. Machine code 3 – two pass assembly. Disc drives for the Beeb. Programming forum. Program protection. Micros in schools – new series. Commodore Pet printer used with Beeb. BBC programs written on an Atom. Extra Atom memory.

7. February 1 MHz bus examined (4). 3D Atom graphics (3). Atom BBC Board reviewed (3). Machine code 4 – memory (5). BBC Computer Literacy update (1). Atom error handling (2). Micros in schools 2 – getting organised (6). Hints and Tips (4). Beeb Forum (3). Reviews of *Wordwise* (2) and the Amber printer (1).

8. March Chess on the BBC micro (3). Sound on the Beeb (4). Printers for beginners (4). Atom analogue converter (2). Schools 3 – micros and maths (6). Machine code 5 – indirect addressing (3). DIY lightpen (5). MEP's *Microprimer* review (2). Atom Ross toolkit review (1). Beeb Forum (2). Assembly language and Pascal book reviews (2).

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9. April *Hexangle* game listing (4). Bach on the Beeb (4). Hints & Tips on disc drives (4). Machine code 6 – the CALL statement (4). Interfacing the 1 MHz bus (3). Schools 4 – young children and micros (6). Graphics listings (2). Printers for beginners 2 (4). Reviews of BCPL, educational software and Atom software (3).

10. May Review of Basic II(1). Graphics listings(1). New *FX calls in OS1.2(1). Colour mixing on the Beeb(4). Jazz, blues and folk on the BBC(6). Schools 5 – language development(6). DIY Beeb interface box(4). Atom sound board(5). A to Z of printing: how to get going(4). Hints and Tips: PROCs, discs and FNs(5). Printer, software and book reviews.

11. June Techniques series – sorting(2). Hints and Tips: 50p network(5). Drawing techniques and CAD(5). Machine code: interrupts(6). Schools 6 – information technology. Atom Forum. Beeb Forum. Printers – write your own graphics dumps(4). Comparative review of *View* and *Wordwise*(3). Three graphics packages reviewed(3). Test of *Acorn User*'s interface box(4).

12. July Techniques – hash tables(2). Hints and Tips: logic made easy(5). Recursion and graphics(6). Handling strings(3). Two ideas for passing variables(2). Beeb aids the blind(2). DIY second keyboard(5). Beeb Forum. Sounds on the Atom(2). Hardware, firmware, software and book reviews. Atom Forum.

13. August Printer graphics and dumps(2). Techniques – Tree structures and sorting(2). All the fun of the fair(7). 40/80 disc copier(2). Colour painting(5). Basic II: random access files(2). Screen dumps for Olivetti, Centronics and Seikosha(5). Atom strings(3). Reviews of Tandy CGP115 printer, five educational packs, A to D converter.

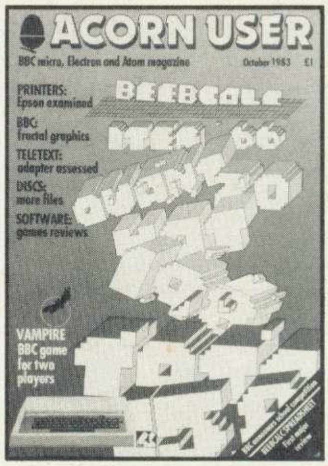
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14. September Techniques – ink-blots and mazes. Painting by lightpen. DFS space explored. Beeb Forum. *Mega*



Monsters game listing. Machine code graphics dumps. Atom Forum. Atom cassette recorder check. Reviews of Atom RAM boards, Cumana disc manual, *Logo* for schools, Hobbit floppy tape and books.

15. October Women and computing. Techniques – random numbers. Review of Computer Concepts' *Beebcalc*.



Fractal graphics. 57 files on 40 & 80 track discs. *Vampire* game listing. Beeb Forum. Assembly code controls tab key. Osfile merging. Atom future. Atom verify routine. Reviews of *Vu-Type*, Procyon Atom book, Epson FX80, Teletext adapter, disc drive, software.

16. November Techniques – impossible problems. Contour graphics. Connecting two Beebs together. XREF: sorts & lists variable, function and procedure names. Assembler utilities in Basic II. OS, VDU, *FX, OSBYTE calls – **pull-out poster**. Disc overlays. Adding extra Atom commands. Reviews of 7 educational packs, Atom ROM, books, games.

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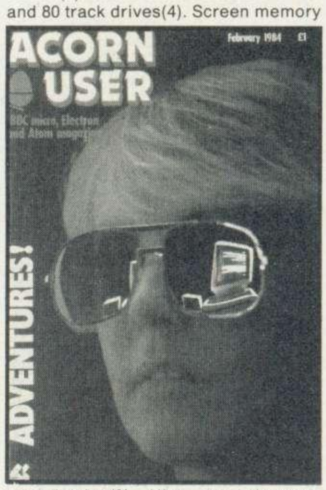
17. December Random graphics. Animated graphics in colour. Techniques – graphs. Hints & Tips. Universal printer dump. 6522 connected to the Electron. Saving machine code. Beeb Forum. Graphics **pull-out poster**. **Index:** July 82–July 83. Forum Extra: EQUS. BBC helps the disabled. Schools – data processing. Transferring data between Beebs, Atoms . . . or Pets. Atom block demolition utility. Atom disassembler program. Reviews of software, books, educational programs from Chalksoft.

18. January 1984: Games special issue Techniques – graphs part 2. Stacks and queues, Basic and languages. Hints & Tips. Voice chip revealed. How to write games. Electron interfacing. Beeb Forum. Life graphics routines. *Defencecom* game listing. *The Train Game* listing. Machine code graphics. Where to put machine code. Schools – handling data. Juki daisywheel printer examined. Atom Forum and adventure.



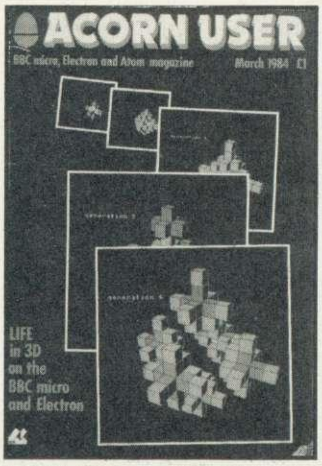
Reviews of utilities, software, *Beeline* wordprocessor, educational packages, two chess programs.

19. February: Adventures special issue Techniques – efficient sorts(3). PROC for a numeric keypad on the Beeb keyboard(1). 12 graphics listings(1). Random access filing on disc(5). Locking files(2). MCP40 printer/plotter looked at(5). Hints & Tips(3). Beeb Forum(2). Make discs readable on 40 and 80 track drives(4). Screen memory



organisation(3). Hints on adventure design(3). Adventure action(4). Adventure ideas in computer language(2). Text compression(2). Word-crunch-

ing(4). VIA chip on Electron to drive a parallel printer(3). Atom Forum(2). Schools – simulation packages(4). Reviews: *Disc Doctor*, Leasalink's DFS upgrade, Hitachi's microdrive system, Solidisk's sideway RAM board, software.
20. March Utility: timing routine. Fractals. Teletext and mode 7 dump. ROMs reviewed. Hints & Tips. Beeb Forum. Add sounds to your games. Learn Lisp



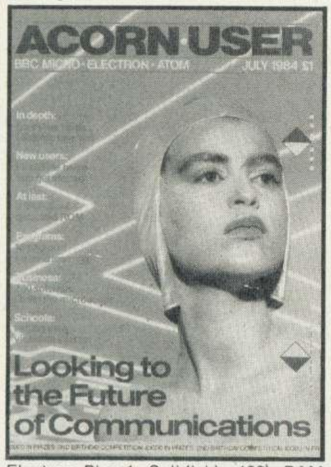
1. Cube graphics. Printer driver for View. Basic II from Basic I. Beeb's ADC chip. Atom Forum. Listing formatter for the Atom. Atom 'bytes free' routine. Schools – test of *Factfile*. Keyboard skills. Amcom DFS v Acorn DFS. Reviews: *Beebpen* wordprocessor, Atom expansion system, software, books.
21. April Beeb graphics on TV(3). 6845 chip explored(3). Advanced filing systems(1). Lisp 2(4). Hints & Tips(3). Beeb Forum(4). Choose disc tracks to copy(4). Function key editing(4). Teletext dumps(3). CES scrutinised(3). Passing variables(2). Computer Concepts' graphics ROM(4). Schools – simulations(4). Calculating Easter dates(3). Better programming(3). Atom Forum(2). Atom ROM routines(5). Converting BBC to Atom Basic(2). Three printers compared(2). Reviews: software, Aries B20 RAM board, *Toolkit*, Monitors.

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22. May Bitstik graphics system. Hints & Tips. 6502 second processor examined. Lisp 3. Beeb Forum. Disc utility to keep track of available space. Statistics. Pattern graphics. OSWORD explained. 4 colour graphics listings. Second-hand



disc drives. Education – do girls get a fair deal? Atom Forum. BBC to Atom Basic 2. Reviews: British Micro's Grafpad, *Edword* wordprocessor, 4 sprite generators, Opus microdrive, Beasty, software.
23. June Acorn Z80 second processor(3). Forth(2). Graphics to brighten up your games(2). Soft Pottery graphics(4). Go faster and save memory space(3). Rapid search and load routine for tapes(2). How the Beeb and Electron work 1(3). Business: reviews and how to gently enter office computerisation(4). Education – adult literacy(3). Dumping Atom programs on the BBC(2). Atom Forum. Software copyright laws(2). Hints & Tips(4). Techniques – B-Trees(3). Beeb Forum(2). Reviews of monitors, printers, books, software, adventures, EPROM programmer.
24. July Communications: the future; portable micros; modems & electronic mail. Hints & Tips. First Byte: using your micro. Beeb Forum on Basic. How it works II: slow down the Beeb. Business: Acorn's Z80 software, Starbase ROM. Education: a look at Edfax, how to teach facts. Atom Forum. Converting BBC to Atom Basic. Reviews:



Electron Plus-1, Solidisk's 128k RAM board, three IEEE interfaces, Canon colour and Brother printers, ADE ROM.
25. August Downloading the weather. Teaching tots: keyboard overlays, activity board. First Byte: writing & debugging programs. Hints & Tips. Beeb Forum: 6502 second processor & Tube tips. How it works III: random numbers. Business: Plan software for Z80. Atom Forum, avoiding errors. Reviews: 3 drawing packs, Torch Unicomm, MCP's Interbeeb, software plus for Micronet.
26. September Decoding radio signals, First Byte: getting moving. Hints & Tips.



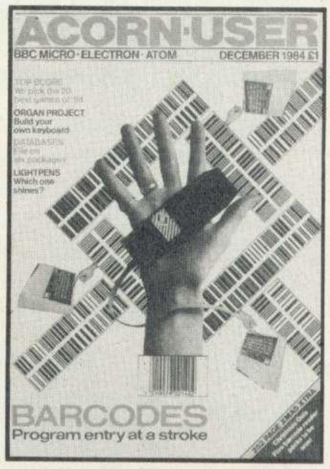
Education: problem solving. Sprite design and animation part I. Beeb Forum: fastest dump. Write your own disc formatter. How it works IV: random number generator. Business: Nucleus software for Z80, accounts. Atom Forum, ? and !. Reviews: Torch Unicorn, Quinkey, Parfitt plotter, Turbo compiler, Multi-aid.

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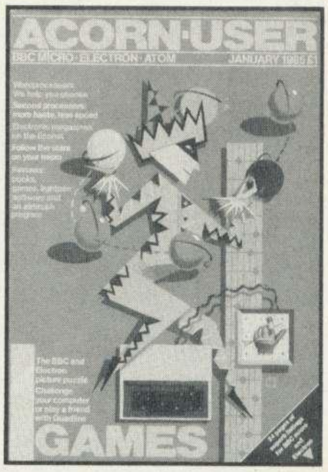
27. October The BBC and space. First Byte: noises on the Elk. Hints & Tips. Sprite design and animation part II. Programming the 8271. Sorting techniques. Diagnosing ills in the Beeb. Beeb Forum: NFS update. Education: report on government scheme, review of Microtext. Atom: wordprocessor. Communications: bulletin boards. Reviews: Basic utility ROMs, sideways ROM sockets, Bearsoft's Editor, Watford's Buffer & Backup, Ampersand's Colour module.
28. November Acorn's ABC range. First Byte: drawing. Hints & Tips: 3D-effect printing. Sprite design and animation part III. Floating point variables. ROM juggler. *Micro Live*. Education: news, Edword in the classroom, school quiz. Atom forum: hardware, the Auto command. Reviews: Six turtles and buggies. Toad's extension socket, Watford's Speech Synthesiser and



Beebfont ROM, BBtype, Romex 13 ROM board, 3 language coaching packs, two graphics tablets.
29. December Guide to bar codes. First Byte: text & graphics windows. Hints & Tips: control codes for Epsons. The Domesday project. Low-cost keyboard for the Beeb. Dumping games' screens. Speed up your micro. DIY database. Education: news, science quiz, review



of the Dudley suite of software. Atom: Forum, build a ROM pager, competition. Reviews: 6 databases compared, part I of lightpens, Acornsoft's Logo and Pascal, best games of 1984.
30. January 1985 Games special: Quadline, Picture Puzzle, musical tunes. Colourfill graphics. Hints & Tips. Operation



Raleigh report. Setting up your own teletext database. Second processors examined. Education: news, activity board revisited. Reviews: 6 wordprocessors compared, three astronomy packs, software for lightpens.

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Eleven issues are not available – July 1982; February, March, April, May, June, July and August 1983; February, April and June 1984. Photocopies of articles are available at 18p a page (minimum charge 50p, inclusive of postage). Orders should be addressed to AU Photocopies, Redwood Publishing, 68 Long Acre, London WC2E 9JH. Figure in brackets indicates the number of pages in each article.

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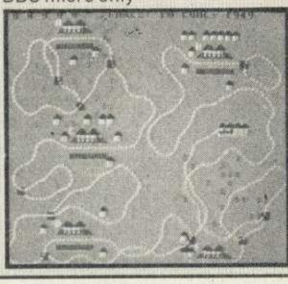
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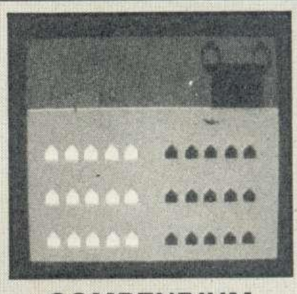


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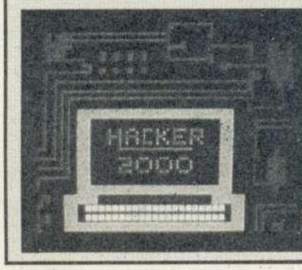


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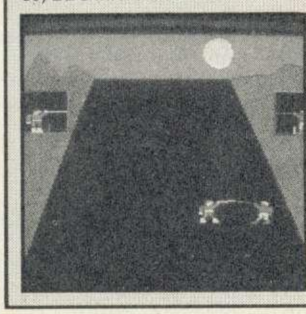




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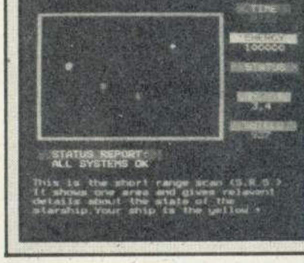
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TELLSCOPE is an early learning package for 2 to 10 year-olds which provides a kaleidoscope of words, pictures and music. It is designed with options to test word/picture recognition and association, as well as memory and speed, and includes upper or lower case text. These options make it suitable for a wide range of ages, and for use with or without adult supervision.

Although the application is serious, the emphasis is on fun, and to add to this a selection of nursery rhyme tunes is played while the program runs.



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ASTRO BLASTER: As commander of the SS Destroyer, you patrol space to seek out and destroy asteroid swarms threatening the space lanes. But these are not the only peril on the fringes of civilisation – alien pirate ships prey on any ship they find. With every few waves, you must return to base to refuel, but beware, docking is no easy task.



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See 'Hints & Tips', page 39

YELLOW PAGES INDEX

† *with Plus 1*

Listing 1. Lorcan Mongey's program to allow *Sphinx Adventure* to be run on the Electron

```
  1 REM Listing 1
 10 REM Window program for Sphinx Adventure
 20 REM Hints & Tips
 30 REM Acorn User June 1985
 40 REM For the Electron
 50 :
 60 MODE 6
 70 N%=8:REM Number of lines in the window
 80 VDU 28,0,24,39,25-N%
 90 HIMEM=&6000+(25-N%)*320
100 PAGE=&B00
110 LOAD "SPHINX"
```

Listing 2. Routine to allow double height text in mode 7

```
  1 REM listing 2
 10 REM double height input routine
 20 REM by Martin Phillips
 30 REM BBC micro only
 40 REM (c) Acorn User June 1985
 50 :
 60 MODE 7
 70 name$=""
 80 PRINTTAB(0,2)CHR$141"NAME PLEASE "
 90 PRINTTAB(0,3)CHR$141"NAME PLEASE ";
100 REPEAT
110 name$=name$+GET$
120 PRINTTAB(14,2)name$
130 PRINTTAB(14,3)name$;
140 UNTIL RIGHT$(name$,1)=CHR$(13)
150 PRINTTAB(0,6)"HELLO "name$
```

Listing 3. Alternative routine for double height lettering

```
  1 REM listing 3
 10 REM double height input routine
 20 REM by Martin Phillips
 30 REM BBC micro only
 40 REM (c) Acorn User June 1985
 50 :
 60 MODE 7
 70 name$=""
 80 PROCdouble(0,2,"NAME PLEASE ")
 90 REPEAT
100 name$=name$+GET$
110 PROCdouble(14,2,name$)
120 UNTIL RIGHT$(name$,1)=CHR$(13)
130 PRINTTAB(0,6)"HELLO "name$
140 END
150
160 DEFPROCdouble(horpos,vertpos,word$)
170 FOR N=0 TO 1
180 PRINTTAB(horpos,vertpos+N)CHR$(141)word$;
190 NEXT N
200 ENDPROC
```

See 'Scroll On', page 87

How to enter Bulletin Board

THE *Bulletin Board* program is a mixture of Basic and assembler, and as such should present no real problems to key in.

The assembler mnemonics can be rather repetitive so it is worth pre-defining the 10 red function keys to do this job quickly for you. The Sideways RAM program notes on page 102 provide a short program plus key template to help you do just this. Once the program has been keyed in save it before doing anything else.

Once you have entered the program the assembler can be checked by generating a checksum for it. To do this add the following lines:

```
81 code%=&4000
82 A%=0
83 FOR N%=&4000 TO &40F8
84 A%=A%+?N%
85 NEXT N%
86 PRINT"Checksum is :";A%
87 END
```

Now RUN the program and correct any errors that are signalled. When all is well the program should return the checksum detail,

Checksum is: 31955

If you do not get this value then recheck the assembler listing. Once this figure agrees delete lines 81 to 87 inclusive with,

DEL. 81,87

and RUN the program to see the end result.

Adapting the Bulletin Board

Adapting the Bulletin Board for our own needs is simple enough. Your own personal messages can be placed into the PROCnotice-board lines, 170 to 210 in the program – you can of course add more lines if you wish. One problem that can occur when altering the length of the text to be scrolled is a 'jitter'. This is caused by timing changes and can be tweeked by adding or deleting NOP's to line 1850. This needs to be done by trial and error, and only if the text is drastically different in length. As a rule of thumb, for quite short messages delete an NOP and for long ones add an NOP.

A useful change is to alter the program so you can input the message to be displayed. To do this, add these lines:

```
50CLS: INPUT''Please enter your message:''message$
170PROCnotice_board(message$)
```

delete lines 180, 190, 200 and 210. Also delete a single NOP from line 1850 which will now read:

```
1850NOP:NOP
```

When the program is RUN you'll be prompted to enter your message; simply do so and press Return. As there is a wrap-around effect, always type in a couple of spaces at the end of the message so that it does not butt directly onto the beginning. This month's listing cassette contains both versions of the program.

```
   10 REM BULLETIN BOARD
   20 REM Jeff Tullin
   30 REM BBC Micro only Basic I or II
   40 REM (c) Acorn User 1985
   50 :
   60 osbyte=&FFF4
   70 oswrch=&FFEE
   80 osword=&FFF1
   90 PROCdefinechars
  100 PROCreservespace
  110 PROCassemble
  120 MODE7
  130 PROCscreen
  140 :
  150 REPEAT
  160 :
  170 PROCnotice_board("This is a test d
esigned to show the Bulletin Board progr
am in action.Strings of up to 255 charac
ters in length can be passed to the rout
ine.Longer messages can be created by su
ccesive calls to PROCnotice-board ")
  180 :
  190 PROCnotice_board("with  various se
ctions of text. All printable characters
 are handled by the routine, and this in
cludes user defined characters embedded
in strings like this...."+CHR$224+CHR$32
+CHR$225+CHR$32+CHR$225+CHR$32+CHR$225+"
    ")
  200 :
  210 PROCnotice_board("I hope that you
find this program useful."+CHR$ 226+CHR$
226+CHR$226+CHR$226+"    ")
  220 :
  230 UNTIL FALSE
  240 END
  250 :
  260 DEF PROCscreen
  270 VDU23;8202;0;0;0
  280 REM COL$ gives double height
  290 REM blue text on cyan background
  300 COL$=CHR$(150)+CHR$(157)+CHR$(132)
+CHR$(141)
  310 PRINT''COL$'COL$
  320 PRINT COL$;" * Acorn User Bulletin
 Board *"
  330 PRINT COL$;" * Acorn User Bulletin
 Board *"
  340 PRINT COL$''''''''''''''COL$'COL$
  350 PRINT COL$;" by Jeff Tullin"
  360 PRINT COL$;" by Jeff Tullin"
  370 PRINT COL$'COL$
  380 ENDPROC
  390 :
  400 DEF PROCassemble
  410 DATA 2,18,39,7
  420 REM data for window
  430 READ A,B,C,D
  440 A%=&7C00+(D*40+A)
  450 REM A% now points to top left of
  460 REM scrolling window area
  470 :
  480 FOR X=0 TO 2 STEP2
  490 P%=code%
  500 [OPT X
  510 :
  520 .scroll
  530 PHA
  540 TYA
  550 PHA
  560 TXA
  570 PHA
  580 LDA #A% MOD 256
  590 STA &70
  600 STA &72
```

```
610 LDA #A% DIV 256
620 STA &71
630 STA &73
640 \ loads address of top left
650 \ of window into &70-&73
660 :
670 LDX#0
680 .outerloop
690 DEC&72
700 LDY#1
710 \
720 .innerloop
730 LDA (&70),Y
740 STA (&72),Y
750 CPY #(C-A)
760 BEQ loopend
770 INY
780 CLC
790 BCC innerloop
800 :
810 .loopend
820 LDA #32
830 STA (&70),Y
840 INX
850 CPX#(B-D)
860 BEQ OUT
870 :
880 .nextline
890 CLC
900 LDA &70
910 ADC #40
920 STA &70
930 STA &72
940 BCC outerloop
950 LDA &71
960 ADC #0
970 STA &71
980 STA &73
990 CLC
1000 BCC outerloop
1010 :
1020 .OUT
1030 PLA
1040 TAX
1050 PLA
1060 TAY
1070 PLA
1080 RTS
1090 :
1100 .BIG
1110 LDX#0
1120 :
1130 .getletter
1140 LDA message,X
1150 CMP #13
1160 BNE not_last_letter
1170 RTS
1180 :
1190 .not_last_letter
1200 STX&76
1210 STA subject
1220 LDX #subject MOD 256
1230 LDY #subject DIV 256
1240 LDA #&0A
1250 JSR osword
1260 :
1270 LDX &76
1280 LDA #128
1290 STA mask
1300 :
1310 .innerloop2
1320 LDA #31
1330 JSR oswrch
1340 LDA #38
1350 JSR oswrch
1360 LDA #8
1370 JSR oswrch
1380 :
1390 LDY #0
1400 .outputrow
1410 LDA info,Y
1420 AND mask
1430 CMP mask
1440 BNE space
1450 LDA #ASC"@"
1460 JSR oswrch
1470 JMP downone
1480 :
1490 .space
1500 LDA #32
1510 JSR oswrch
1520 :
1530 .downone
1540 LDA #10
1550 JSR oswrch
1560 LDA #8
1570 JSR oswrch
1580 :
1590 INY
1600 CPY #8
1610 BNE outputrow
1620 JSR scroll
1630 :
1640 JSRsetsystemclock
1650 :
1660 .delay
1670 JSR readsystemclock
1680 LDA &D00
1690 CMP #1
1700 BNE delay
1710 :
1720 LDA mask
1730 LSR A
1740 STA mask
1750 CMP #0
1760 BNE innerloop2
1770 INX
1780 JMP getletter
1790 :
1800 .subject
1810 NOP
1820 .info
1830 NOP:NOP:NOP
1840 NOP:NOP:NOP
1850 NOP:NOP:NOP
1860 .mask
1870 NOP
1880 :
1890 .readsystemclock
1900 TYA
1910 PHA
1920 TXA
1930 PHA
1940 LDX #0
1950 LDY #&D
1960 LDA #1
1970 JSR osword
1980 PLA
1990 TAX
2000 PLA
2010 TAY
2020 RTS
2030 :
2040 .setsystemclock
2050 PHA
2060 TYA
2070 PHA
2080 TXA
2090 PHA
2100 LDA #0
2110 LDY #5
2120 :
2130 .flush
2140 STA &D00,Y
2150 DEY
2160 BPL flush
2170 :
2180 LDX #&1
2190 LDY #&D
2200 LDA #2
2210 JSR osword
2220 PLA
2230 TAX
2240 PLA
2250 TAY
2260 PLA
2270 RTS
2280 :
2290 .message
2300 ]:NEXT
2310 ENDPROC
2320 :
2330 DEF PROCdefinechars
2340 VDU23,224,28,28,8,127,
8,20,34,65
2350 VDU23,225,
99,99,28,28,
72,92,92,124
2360 VDU23,226,128,64,32,16,
32,64,128,0
2370 ENDPROC
2380 :
2390 DEF PROCreservespace
2400 DIMcode%500
2410 ENDPROC
2420 :
2430 DEFPROCnotice_board(A$)
2440 $message=A$
2450 CALL BIG
2460 ENDPROC
```

Variables

A,B,C,D,A% Used to pass information about the scrolling window size to the assembler section

X Assembler option – set in this instance to give invisible assembly

COL$ Holds codes to set blue double height text on cyan background

Procedures

PROCscreen Draws borders and prints headings

PROCassemble Assembles code into space reserved by . . .

PROCreservespace (500 bytes)

PROCdefinechars Defines a few UDGs for demonstration purposes

PROCnotice_board(STRING) Passes the string variable to the machine code section

Assembler routines

.scroll Scrolls window to left

.nextline Updates working addresses held in zero page to point to next screen line

.BIG Responsible for printing vertical dot patterns of successive characters

.setsystemclock Sets hardware clock to zero via OSWORD call

.readysystemclock Reads hardware clock as above. Data stored in location &D00

.delay Imparts a small delay to make the scrolling both smoother and readable

See 'Beeb Forum', page 115

Listing 1. Add colour to *Wordwise* with John Martin's program

```
   10 REM Colouring a Wordwise File
   20 REM by J K Martin
   30 REM for BBC micro with Wordwise
   40 REM (c) Acorn User June 1985
   50 :
   60 T$=" COLOURING A WORDWISE FILE"
   70 ON ERROR GOTO 130
   80 *TV255
   90 *FX15,0
  100 MODE7:PROCinitiate
  110 PROCreadfile:PROCcls
  120 PRINTTAB(5,5)" E N D   OF   P R O
G R A M "
  130 CLOSE#0:END
  140 :
  150 DEF PROCinitiate
  160 PRINTTAB(2,3)T$
  170 INPUTTAB(2,5)" FILE-NAME eg WDEMO
";file$
  180 VDU14:BC=0:TC=7
  190 BG$=CHR$129+CHR$157:FG$=CHR$135
  200 sp$=CHR$13+CHR$10+"  Press SPACE-B
AR to continue."+CHR$13+CHR$10
  210 CLS
  220 FOR J=0TO23:PRINTTAB(0,J)BG$:NEXT
  230 PRINTTAB(5,24)" Tap SHIFT to conti
nue";
  240 VDU28 0,22,39,1
  250 ENDPROC
  260 :
  270 DEF PROCreadfile
  280 CH=OPENUP(file$)
  290 REPEAT:C%=BGET#CH
  300 IF C%=2 PROCcontrol:GOTO 330
  310 PRINTCHR$C%;
  320 IF POS=39 VDU10:VDU13:GOTO 340
  330 IF C%=13 VDU10 ELSE GOTO 350
  340 PRINTBG$;FG$;
  350 UNTIL EOF#CH:CLOSE#CH
  360 ENDPROC
  370 :
  380 DEF PROCcontrol
  390 C$="":REPEAT:C%=BGET#CH
  400 C$=C$+CHR$C%:UNTIL C%=7
  410 REM Command
  420 CM$=LEFT$(C$,2)
  430 IF VAL(CM$)>0 PRINTCHR$(128+VAL(CM
$));:REM Colour number
  440 REM Command value
  450 CV=VAL(MID$(C$,3,2))
  460 REM Text colour
  470 IF CM$="TC" TC=CV
  480 FG$=CHR$(128+TC)
  490 REM Background colour
  500 IF CM$="BC" BC=CV
  510 IF BC=0 BG$=CHR$156
  520 IF BC>0 BG$=CHR$(128+BC)+CHR$157
  530 REM Other commands
  540 IF CM$="CS" PROCcls
  550 IF CM$="GT" PROCget
  560 ENDPROC
  570 :
  580 DEF PROCcls
  590 REPEAT UNTIL INKEY(-1)
  600 CLS:ENDPROC
  610 :
  620 DEF PROCget
  630 *FX15,0
  640 PRINTsp$:G=GET
  650 VDU11,11:PRINTSTRING$(36," "):VDU1
1:PRINTBG$;FG$;
  660 ENDPROC
```

A demonstration program, WDEMO, is included on our monthly listing cassette – see page 96 for details of how to order this.

Listing 2. R Bunnett's *Wordwise Plus* program compactor

```
REM Program Compactor
REM by R. Bunnett
REM for Wordwise Plus
REM (c) Acorn User 1985

PRINT
PRINT "Segment number ";
REPEAT
  LET S% = GET-48
  UNTIL S%.=0 AND S% <9

PRINT S%
SELECT SEGMENT S%

REM strip double spaces
CURSOR TOP
REPEAT
 REPLACE "  "," "
  UNTIL EOT

REM strip return space
CURSOR TOP
REPEAT
  REPLACE "¦R ","¦R"
  UNTIL EOT

REM strip return return
CURSOR TOP
REPEAT
  REPLACE "¦R¦R","¦R"
  UNTIL EOT

REM strip remarks
CURSOR TOP
REPEAT
  FIND "REM"
  FKEY 3
  FIND "¦R"
  CURSOR RIGHT 1
  FKEY 3
  DELETE MARKED
  UNTIL EOT

REM strip lets
CURSOR TOP
REPEAT
  REPLACE "LET ", ""
  UNTIL EOT

RECOUNT
DISPLAY
```

Listing 3. Produce an on-screen function key strip with a program from D J Osbourne

```
10 REM Dynamic function key strip
20 REM by D J Osbourne
30 REM for BBC-Electron-6502SP
40 REM (c) Acorn User June 1985
50 MODE4:VDU19;4;0;0;
60:
  70 DIM f$(4,10)
  80 f$(1,0)=" To":f$(1,1)=" be":f$(1,2
)=" or"
  90 f$(2,3)="not":f$(2,4)=" to":f$(2,5
)=" be"
```

Continued ▶

◀ Continued

```
  100 f$(3,6)="that":f$(3,7)=" is":f$(3,
8)=" the":f$(3,9)=" ?"
  110 INPUT "Number of levels ",N%
  120 IF N%<1 OR N%>4 THEN 110
  130 PROCfk
  140 END
  150 DEFPROCfk
  160 N%=N%+1
  170 X=127:Y=40*N%
  180 MOVE 5,0
  190 FOR I=0 TO 9
  200 PLOT 1,X,0
  210 PLOT 1,0,Y
  220 PLOT 1,-X,0
  230 PLOT 1,0,-Y
  240 PLOT 0,X,0
  250 NEXT:Y=Y-5
  260 MOVE 5,Y-33: DRAW 1270,Y-33
  270 VDU5
  280 MOVE 0,0
  290 FOR I=0 TO 9
  300 MOVE I*127+30,Y
  310 PRINT "f";I
  320 FOR J=1 TO N%-1
  330 MOVE I*127+7,Y-J*40
  340 PRINT f$(J,I)
  350 NEXT J,I
  360 VDU4,28;29-N%,39;
  370 ENDPROC
```


Listing 4. Miranda Williams' program to convert embedded control codes

```
   10 REM CHR$ Doctor
   20 REM by Miranda Williams
   30 REM for BBC-Electron-6502SP
   40 :
   50 MODE7
   60 CLOSE#0
   70 DIM string 8
   80 $string=CHR$34+"CHR$"
   90 PROCopen_files
  100 PROCdoctor
  110 CLOSE#0
  120 END
  130 :
  140 DEF PROCopen_files
  150 CLS
  160 PRINT'"N.B. The input file MUST be
 a text file. Convert it to text by *SPO
OLing if you"'"have not done so."
  170 REPEAT
  180 PRINT''"Type in the name of the fi
le to doctor."'
  190 INPUT"Input filename ",infile$
  200 chanin=OPENUP infile$
  210 IF chanin=0 THEN PRINTCHR$7;'"NO S
UCH FILE!"
  220 UNTIL chanin<>0
  230 PRINT''"Type in the name for the o
utput file."'"TEMP will be used if you p
ress <RETURN>"'
  240 INPUT"Output filename ",outfile$;
  250 IF outfile$="" THEN outfile$="TEMP
"
  260 check=OPENUP outfile$
  270 IF check<>0 THEN PRINTCHR$7;'"FILE
 EXISTS. Delete or Rename it,"'"then res
tart.":CLOSE#0:STOP
  280 PRINT'"Source file is "infile$","'
"Destination file is "outfile$"."
  290 chanout=OPENOUT outfile$
  300 ENDPROC
  310 :
  320 DEF PROCdoctor
  330 REPEAT
  340 inchar=BGET#chanin
  350 IF inchar<129 OR (inchar>159 AND i
nchar<255) THEN BPUT#chanout,inchar ELSE
 PROCchrout
  360 UNTIL EOF#chanin
  370 PRINT'"File conversion completed."
'"Output is in file "outfile$"."''"Type
NEW, then"'"*EXEC "outfile$" to obtain B
ASIC program."
  380 ENDPROC
  390 :
  400 DEF PROCchrout
  410 $(string+5)=STR$inchar+CHR$34
  420 FOR I=0 TO 8
  430 BPUT#chanout,string?I
  440 NEXT
  450 ENDPROC
```

Listing 5. Three-dimensional textured printing from Shakir Abbas

```
    1 REM 3D PRINTING
    2 REM by Shakir Abbas
    3 REM for BBC and Electron
   10 MODE1:SPACE%=40:VDU19,2,3,0,0,0
   20 XMAG%=3:YMAG%=3:COL%=1
   30 PROCTEXT("COLOURED",150,800)
   40 XMAG%=2:YMAG%=2:SPACE%=48:COL%=2
   50 PROCTEXT("THREE",350,700)
   60 XMAG%=3:YMAG%=4:SPACE%=48
   70 PROCTEXT("DIMENSION",0,500)
   80 XMAG%=5:YMAG%=6:SPACE%=56:COL%=3
   90 PROCTEXT("SHADES",0,300)
  100 XMAG%=3:YMAG%=2:COL%=1
  110 PROCTEXT("BY",520,240)
  120 PROCTEXT("SHAKIR",260,170)
  130 PROCTEXT("ABBAS",290,100)
  140 PRINTTAB(0,30);" ";STRING$(39-LEN(
S$)," ")
  150 END
  160 :
  170 :
  180 DEFPROCTEXT(S$,A%,B%)
  190 D%=0:E%=A%:C%=LEN(S$)-1:GCOL0,COL%
  200 PRINTTAB(0,30);S$;STRING$(39-LEN(S
$)," ")
  210 FORU%=1 TO LEN(S$)
  220 FORY%=0 TO 32
  230 FORI%=D% TO D%+32
  240 IF POINT(I%,Y%+32)<>0 THEN PLOT69,
I%*XMAG%+A%,Y%*YMAG%+B%
  250 NEXTI%:A%=A%+C%:NEXTY%:E%=E%+SPACE
%:A%=E%:D%=D%+32:C%=C%-2
  260 NEXT U%
  270 ENDPROC
```

Listing 6. N L Smith lets you load and save screen memory with the Aries B20 RAM board

```
   10 IF PAGE=&1600 aries=1 ELSE aries=0
   20 REM for AMCOM DFS with PAGE=&1500
   30 REM adjust to suit your DFS.
   40 REM Or use IF HIMEM=&8000 aries=1
etc
   50 REM program follows
   60 :
 1000 DEF PROCsave
 1010 IF aries=1 THEN *FX111,0
 1020 *SAVE SCREEN 3000 7FFF
 1030 IF aries=1 THEN *FX111,1
 1040 ENDPROC
 1050 :
 1060 DEF PROCload
 1070 REM same format as SAVE
```

See 'New Twists to Sideways RAM', page 119

How to enter the program

THIS sideways RAM utilities listing is without doubt the longest program we've ever carried in *Acorn User*, so read these notes to ensure you enter it with the minimum of fuss.

First enter and save the following program:

```
 10 *KEY0 LDA
 20 *KEY1 LDX
 30 *KEY2 LDY
 40 *KEY3 STA
 50 *KEY4 STX
 60 *KEY5 STY
 70 *KEY6 BNE
 80 *KEY7 BEQ
 90 *KEY8 JSR
100 *KEY9 INY
```

This will define the 10 red function keys with the most commonly used assembler commands. Cut-out or copy the keystrip on page 103 and place it under the plastic cover of your Beeb. Now whenever a listing dictates the use of any of those commands you simply make a single keypress.

To enter the listing use the automatic line numbering command AUTO, which will provide you with the correct line numbers up to line 6900. After this the line numbers jump to 20000 onwards. So once line number 6910 is generated press Escape, and save what you've typed in so far, in case of disaster.

To start the re-numbering enter:

```
AUTO 20000
```

and continue as normal to complete the program, and then save it. This disjointed line numbering is deliberate as it will allow you to add extra program lines as they are presented in the next two issues of *Acorn User*.

Before running the program obtain a checksum to ensure that you have typed everything correctly, as follows. First alter line 50 to read:

```
50 P% = &6000
```

and then add these lines:

```
21781 PROCcheck
26000 DEF PROCcheck
26010 A% = O
26020 FOR N% = &6000 TO &6771
26030 A% = A% + ?N%
26040 NEXT
26050 PRINT "Checksum is:";A%
26060 ENDPROC
```

Once again, save the entire program, using:

```
SAVE "TESTRAM"
```

Now RUN the program. Any errors will be reported immediately plus a line number. Simply correct the listing at the line indicated – this should be straightforward to locate as we have adopted a one command per line approach. Once the listing runs without error, and after a short delay, a checksum should be produced thus:

```
Checksum is: 194982
```

If your figure disagrees then it's debugging time!

Once your checksum is correct, delete lines 21781 and 26000 to 26060 inclusive, and change line 50 back to its original form:

```
50 P% = &8000
```

and save the final version of the source listing, in case there are any mistakes. You will also need this if you wish to add the disc utilities to be presented next month.

Running the program will now assemble the code into the sideways RAM.

Testing

Before you can use the sideways RAM at any point you must inform the BBC micro that it is there. The best way to do this is to hit the Break key. Now type:

```
*HELP
```

and the message:

```
DISC/ROM Utilities
```

should appear with details of the other ROMs present.

Saving the software

Rather than loading and running the source program each time you need to install the sideways RAM software, it's quicker to cut the middle man out and deal with the machine code directly. As it is impossible to save the contents of a sideways area directly with *SAVE, the code must first be copied into RAM. With the machine code present in the RAM enter and run the following short program:

```
  1 REM Rom Copy
  2 REM by Richard Harris
  3 REM for BBC Micro
  4 REM (c) Acorn User June 1985
  5 :
 10 HIMEM=&2FFF
 20 DIM data% 200
 30 FOR J%=0 TO 3 STEP 3
 40 P%=data%
 50 [OPT J%
 60 LDA #0:STA &F6:STA &70
 70 LDA #&80 : STA &F7
 80 LDA #&30 : STA &71
 90 .a LDY #&F
100 JSR &FFB9
110 STA (&70),Y
120 INC &70
130 INC &F6
140 BNE a
150 INC &71
160 INC &F7
170 LDA &F7
180 CMP #&B0
190 BNE a
200 RTS
210 ]
220 CALL data%
```

When the prompt reappears the machine code can be saved using:

```
*SAVE DROM 3000 4FFF 8000 8000
```

Now when you wish to initialise the sideways utilities from disc (or cassette) just *LOAD it in with:

```
*LOAD DROM
```

press Break and away you go.

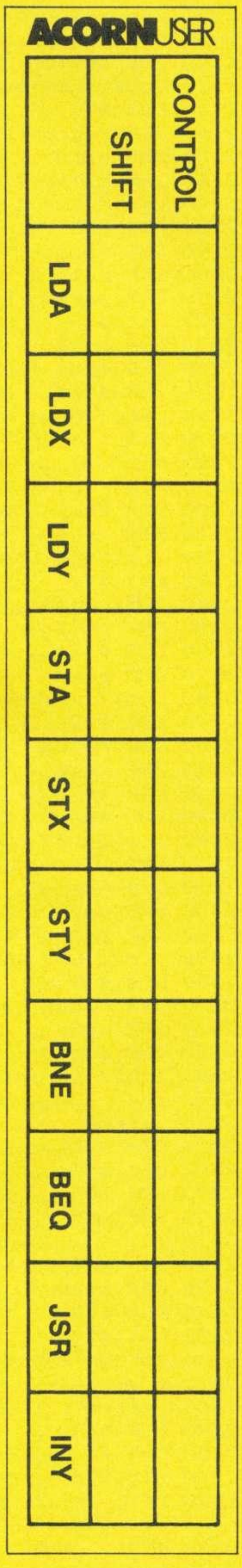
IMPORTANT: Do not try to take shortcuts by saving the machine code generated by assembling at &6000 in the test run above. This will *not* run in sideways RAM as the absolute addresses assembled will be incorrect.

Basic 2 users

If you use Basic 2 then you can shorten the task by using EQUS,EQUB and EQUW in place of the relevant OPT and FN definitions throughout the program, but more particularly from lines 20000 onwards.

Richard Harris' Sideways RAM utilities listing

```
   1 REM Sideways RAM Utilities #1
   2 REM By Richard Harris
   3 REM for BBC Micro Basic I or II
   4 REM (c) Acorn User June 1985
   5 :
  10 cat=&E00
  20 buffer=&B00
  30 param=&9F0
  40 FOR J%=0 TO 3 STEP 3
  50 P%=&8000
  60 [OPT J%
  70 OPT FNequb(0)
  80 OPT FNequw(0)
  90 JMP service
 100 OPT FNequb(&82)
 110 OPT FNequw(&011B)
 120 OPT FNequs("DISC/ROM Utilities")
 130 OPT FNequb(0)
 140 OPT FNequs("(C) R.Harris 1984")
 150 OPT FNequb(0)
 160 :
 260 .boot
 270 LDX #0
 280 STX brk
 290 LDY #&FF
 300 LDA #&AA
 310 JSR &FFF4
 320 JSR push
 330 STX onoff
 340 STX &70
 350 STY onoff1
 360 STY &71
 370 LDX #0
 380 LDY #&FF
 390 LDA #&BB
 400 JSR &FFF4
 410 STX basic
 420 LDX #0
 430 LDY #&FF
 440 LDA #&FD
 450 JSR &FFF4
 460 CPX #2
 470 BNE b4
 480 LDA #0
 490 STA trap
 500 .b4 LDY #&F
 510 .b1 LDA (&70),Y
 520 STA table,Y
 530 DEY
 540 BPL b1
 550 LDA trap
 560 BEQ b2
 570 LDY #&F
 580 .b3 LDA table2,Y
 590 STA (&70),Y
 600 DEY
 610 BPL b3
 620 LDY basic
 630 CPY #&FF
 640 BEQ b2
 650 LDA table2,Y
 660 BNE b2
 670 LDY #0
 680 LDX #&FF
 690 LDA #&BB
 700 JSR &FFF4
 710 .b2 JSR pull
 720 JSR prname
 730 LDA #0
 740 STA inuse
 750 STA brk1
 760 STA brk2
 770 STA vduflag
 780 JMP end
 790 :
 800 .service
 810 PHP
 820 STA temp
 830 PHA
 840 TXA
 850 PHA
 860 TYA
 870 PHA
 880 LDA temp
 890 CMP #3
 900 BNE s3
 910 JMP boot
 920 .s3 CMP #4
 930 BNE s1
 940 JMP command
 950 .s1
 960 .s2 CMP #9
 970 BEQ help
 980 .end
 990 PLA
1000 TAY
1010 PLA
1020 TAX
1030 PLA
1040 PLP
1050 RTS
1060 :
1070 .help
1080 LDA (&F2),Y
1090 CMP #&D
1100 BNE end
1110 JSR &FFE7
1120 JSR prname
1130 LDX #0
1140 LDY #8
1150 JSR message
1160 LDX #122
1170 LDY #9
1180 JSR message
1190 JMP end
1200 :
1210 .prname
1220 LDY #9
1230 .p1 LDA &8000,Y
1240 BEQ p2
1250 JSR &FFEE
1260 INY
1270 BNE p1
1280 .p2 JSR &FFE7
1290 JSR &FFE7
1300 RTS
1310 :
1320 .command
1330 STY temp
1340 LDA (&F2),Y
1350 CMP #&59
1360 BNE co16
1370 INC &F2
1380 BNE co19
1390 INC &F3
1400 .co19 JMP end
1410 .co16
2070 .co9 LDY temp
```



Continued ▶

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```
2080 LDX #70
2090 JSR recog
2100 BNE co12
2110 JMP buffon
2120 .co12 LDY temp
2130 LDX #77
2140 JSR recog
2150 BNE co14
2160 JMP buffoff
2170 .co14 LDY temp
2180 LDX #85
2190 JSR recog
2200 BNE co15
2210 JSR purge
2220 .stop
2230 LDA brk2
2240 BEQ sto1
2250 JSR shift
2260 .sto1 PLA
2270 PLA
2280 PLA
2290 PLA
2300 LDA #0
2310 RTS
2320 .co15 LDY temp
2330 LDX #91
2340 JSR recog
2350 BNE co17
2360 LDA #1
2370 JMP puron
2380 .co17 LDY temp
2390 LDX #99
2400 JSR recog
2410 BNE co18
2420 LDA #0
2430 JMP puron
2440 .co18 LDY temp
2450 LDX #26
2460 JSR recog
2470 BNE co22
2480 JMP pageon
2490 .co22 LDY temp
2500 LDX #33
2510 JSR recog
2520 BNE co23
2530 JMP pageoff
2540 .co23 JMP end
2550 :
2560 .error
2570 JSR syntax
2580 LDX #19
2590 LDY #29
2600 JMP err
2610 :
2620 .error1
2630 JSR sterr
2640 LDX #48
2650 LDY #20
2660 JMP err
2670 :
2680 .sterr
2690 JSR push
2700 LDY #1
2710 STY &71
2720 DEY
2730 STY &70
2740 RTS
2750 :
2760 .recog
2770 LDA data2,X
2780 BEQ r4
2790 CMP (&F2),Y
2800 BEQ r1
2810 CMP #&D
2820 BNE r2
2830 LDA #1
2840 RTS
2850 .r2 ORA #&20
2860 CMP (&F2),Y
2870 BEQ r1
2880 RTS
2890 .r1 CMP #&D
2900 BNE r3
2910 RTS
2920 .r3 INY
2930 INX
2940 BNE recog
2950 .r4 LDA (&F2),Y
2960 CMP #&D
2970 BNE r5
2980 RTS
2990 .r5 CMP #&20
3000 RTS
3010 :
3020 .err1
3030 LDA data3,X
3040 STY temp
3050 LDY #0
3060 STA (&70),Y
3070 LDY temp
3080 INX
3090 INC &70
3100 DEY
3110 BNE err1
3120 RTS
3130 :
3140 .syntax
3150 JSR sterr
3160 LDX #0
3170 LDY #19
3180 JSR err1
3190 RTS
3200 :
3210 .err
3220 JSR err1
3230 JSR pull
3240 JMP &100
3250 :
3260 .push
3270 LDA &70
3280 STA temp1
3290 LDA &71
3300 STA temp2
3310 LDA &72
3320 STA temp3
3330 LDA &73
3340 STA temp4
3350 RTS
3360 :
3370 .pull
3380 LDA temp1
3390 STA &70
3400 LDA temp2
3410 STA &71
3420 LDA temp3
3430 STA &72
3440 LDA temp4
3450 STA &73
3460 RTS
3470 :
3480 .message
3490 LDA data1,X
3500 BEQ tab
3510 JSR &FFE3
3520 .m1 INX
3530 DEY
3540 BNE message
3550 RTS
3560 .tab
3570 INX
3580 DEY
3590 TYA
3600 PHA
3610 LDA data1,X
3620 TAY
3630 LDA #&D
3640 JSR &FFEE
3650 LDA #9
3660 .t1 JSR &FFEE
3670 DEY
3680 BNE t1
3690 PLA
3700 TAY
3710 BNE m1
3720 :
3730 .buffon
3740 LDA inuse
3750 BNE bu1
3760 JSR push
3770 LDA #&A8
3780 LDX #0
3790 LDY #&FF
3800 JSR &FFF4
3810 STX &70
3820 STY &71
3830 SEI
3840 LDY #5
3850 .bu2 LDA &22A,Y
3860 STA insv,Y
3870 LDA setup,Y
3880 STA inadd,Y
3890 LDA newvec1,Y
3900 STA &22A,Y
3910 DEY
3920 BPL bu2
3930 INY
3940 STY full
3950 STY empty
3960 INY
3970 STY inuse
3980 LDA #&3F
3990 CLC
4000 ADC &70
4010 STA &70
4020 LDY #8
4030 .bu3 LDA &F4
4040 STA (&70),Y
4050 DEY
4060 LDA newvec2,Y
4070 STA (&70),Y
4080 DEY
4090 LDA newvec2,Y
4100 STA (&70),Y
4110 DEY
4120 BPL bu3
4130 CLI
4140 JSR pull
```

```
4150 .bu1 JMP stop
4160 :
4170 .buffoff
4180 LDA inuse
4190 BEQ bu5
4200 SEI
4210 LDY #5
4220 .bu4 LDA insv,Y
4230 STA &22A,Y
4240 DEY
4250 BPL bu4
4260 INY
4270 STY inuse
4280 STY brk1
4290 CLI
4300 LDX #3
4310 LDA #21
4320 JSR &FFF4
4330 .bu5 JMP stop
4340 :
4350 .puron
4360 LDX inuse
4370 BNE pon1
4380 BEQ pur3
4390 .pon1 STA brk1
4400 JMP stop
4410 :
4420 .purge
4430 LDA inuse
4440 BNE pur2
4450 .pur3 JSR sterr
4460 LDX #68
4470 LDY #22
4480 JMP err
4490 .pur2 SEI
4500 LDA #0
4510 STA full
4520 STA empty
4530 LDY #5
4540 .pur1 LDA setup,Y
4550 STA inadd,Y
4560 DEY
4570 BPL pur1
4580 CLI
4590 RTS
4600 :
4610 .insert
4620 PHP
4630 CPX #3
4640 BEQ ins1
4650 PLP
4660 JMP (insv)
4670 .ins1 PLP
4680 LDY full
4690 BEQ ins3
4700 SEC
4710 RTS
4720 .ins3 TAY
4730 LDA &74
4740 PHA
4750 LDA &75
4760 PHA
4770 LDA inadd
4780 STA &74
4790 LDA inadd+1
4800 STA &75
4810 TYA
4820 LDY #0
4830 STA (&74),Y
4840 TAY
4850 PLA
4860 STA &75
4870 PLA
4880 STA &74
4890 TYA
4900 INC inadd
4910 BNE ins4
4920 INC inadd+1
4930 LDY inadd+1
4940 CPY #&C0
4950 BNE ins4
4960 LDY #&92
4970 STY inadd+1
4980 .ins4 INC total
4990 BNE ins5
5000 INC total+1
5010 LDY total+1
5020 CPY #&2E
5030 BNE ins5
5040 LDY #1
5050 STY full
5060 .ins5 STX empty
5070 CLC
5080 RTS
5090 :
5100 .remove
5110 PHP
5120 CPX #3
5130 BEQ rem1
5140 PLP
5150 JMP (remv)
5160 .rem1 LDY empty
5170 BNE rem2
5180 PLP
5190 SEC
5200 RTS
5210 .rem2 LDA &76
5220 PHA
5230 LDA &77
5240 PHA
5250 LDA outadd
5260 STA &76
5270 LDA outadd+1
5280 STA &77
5290 LDY #0
5300 LDA (&76),Y
5310 TAY
5320 PLA
5330 STA &77
5340 PLA
5350 STA &76
5360 TYA
5370 PLP
5380 BVC rem3
5390 CLC
5400 RTS
5410 .rem3 INC outadd
5420 BNE rem4
5430 INC outadd+1
5440 LDY outadd+1
5450 CPY #&C0
5460 BNE rem4
5470 LDY #&92
5480 STY outadd+1
5490 .rem4 LDY total
5500 DEY
5510 STY total
5520 BEQ rem6
5530 CPY #&FF
5540 BNE rem7
5550 DEC total+1
5560 BPL rem7
5570 .rem6 LDY total+1
5580 BNE rem7
5590 STY empty
5600 .rem7 LDY #0
5610 STY full
5620 TAY
5630 CLC
5640 RTS
5650 :
5660 .count
5670 PHP
5680 CPX #3
5690 BEQ cou1
5700 PLP
5710 JMP (cnpv)
5720 .cou1 PLA
5730 PHA
5740 STA temp
5750 BIT temp
5760 BVC cou2
5770 LDA brk1
5780 BEQ cou4
5790 JSR purge
5800 .cou4 PLP
5810 RTS
5820 .cou2 LDA temp
5830 AND #1
5840 BEQ cou3
5850 SEC
5860 LDA #0
5870 SBC total
5880 TAX
5890 LDA #&2E
5900 SBC total+1
5910 TAY
5920 PLP
5930 RTS
5940 .cou3 LDX total
5950 LDY total+1
5960 PLP
5970 RTS
5980 :
5990 .escape
6000 JSR sterr
6010 LDX #212
6020 LDY #11
6030 JMP err
6040 :
6050 .pageoff
6060 LDA vduflag
6070 BEQ pag1
6080 SEI
6090 LDA vduv
6100 STA &20E
6110 LDA vduv+1
6120 STA &20F
6130 CLI
6140 LDA #0
6150 STA vduflag
6160 .pag1 JMP stop
6170 :
6180 .pageon
6190 LDA vduflag
6200 BNE pag1
6210 JSR push
6220 LDA #&A8
6230 LDX #0
```

Continued ▶

◀ Continued

```
6240 LDY #&FF
6250 STY pageflag
6260 STY vduflag
6270 JSR &FFF4
6280 STY &71
6290 TXA
6300 CLC
6310 ADC #&15
6320 STA &70
6330 LDY #1
6340 SEI
6350 .pag2 LDA &20E,Y
6360 STA vduv,Y
6370 LDA newvdu1,Y
6380 STA &20E,Y
6390 DEY
6400 BPL pag2
6410 LDY #2
6420 LDA &F4
6430 STA (&70),Y
6440 DEY
6450 LDA newvdu2,Y
6460 STA (&70),Y
6470 DEY
6480 LDA newvdu2,Y
6490 STA (&70),Y
6500 CLI
6510 JSR pull
6520 JMP stop
6530 :
6540 .dopage
6550 PHA
6560 LDA pageflag
6570 BEQ mode0
6580 PLA
6590 CMP #22
6600 BEQ mode
6610 JMP (vduv)
6620 .mode
6630 PHA
6640 TYA
6650 PHA
6660 TXA
6670 PHA
6680 LDX #0
6690 LDY #&FF
6700 LDA #&DA
6710 JSR &FFF4
6720 STX pageflag
6730 PLA
6740 TAX
6750 PLA
6760 TAY
6770 PLA
6780 JMP (vduv)
6790 .mode0
6800 LDA #1
6810 STA pageflag
6820 PLA
6840 BNE pag6
6850 JSR pag6
6860 LDA #14
6870 .pag6 JMP (vduv)
6880 :
6890 .shift
6900 :
20000 .temp OPT FNequb(0)
20010 .temp1 OPT FNequb(0)
20020 .temp2 OPT FNequb(0)
20030 .temp3 OPT FNequb(0)
20040 .temp4 OPT FNequb(0)
20050 .temp5 OPT FNequb(0)
20060 .temp6 OPT FNequb(0)
20070 .brk OPT FNequb(0)
20080 .brk1 OPT FNequb(0)
20090 .brk2 OPT FNequb(0)
20100 .himem OPT FNequb(0)
20110 .page OPT FNequb(0)
20120 .newpage OPT FNequb(0)
20130 .onoff OPT FNequb(0)
20140 .onoff1 OPT FNequb(0)
20150 .table OPT FNequd(0)
20160 OPT FNequd(0)
20170 OPT FNequd(0)
20180 OPT FNequd(0)
20190 .table2 OPT FNequd(0)
20200 OPT FNequd(0)
20210 OPT FNequd(0)
20220 OPT FNequd(0)
20230 .trap OPT FNequb(0)
20240 .mem OPT FNequb(0)
20250 .basic OPT FNequb(0)
20260 .insv OPT FNequw(0)
20270 .remv OPT FNequw(0)
20280 .cnpv OPT FNequw(0)
20290 .inadd OPT FNequw(0)
20300 .outadd OPT FNequw(0)
20310 .total OPT FNequw(0)
20320 .inuse OPT FNequb(0)
20330 .full OPT FNequb(0)
20340 .newvec1 OPT FNequd(&FF42FF3F)
20350 OPT FNequw(&FF45)
20360 .newvec2 OPT FNequw(insert)
20370 OPT FNequb(0)
20380 OPT FNequw(remove)
20390 OPT FNequb(0)
20400 OPT FNequw(count)
20410 .setup OPT FNequd(&92009200)
20420 OPT FNequw(0)
20430 .empty OPT FNequb(0)
20440 .vduflag OPT FNequb(0)
20450 .pageflag OPT FNequb(0)
20460 .vduv OPT FNequw(0)
20470 .newvdu1 OPT FNequw(&FF15)
20480 .newvdu2 OPT FNequw(dopage)
20490 :
20500 .data1
20510 OPT FNequb(11)
20520 OPT FNequs("    ROM")
20530 OPT FNequd(&1400820D)
20540 OPT FNequs("Language Reset State")
20550 OPT FNequb(&D)
20560 OPT FNequw(&1E00)
20570 OPT FNequs("Hard")
20580 OPT FNequw(&1E00)
20590 OPT FNequs("Soft")
20600 OPT FNequs("   On")
20610 OPT FNequb(&D)
20620 OPT FNequs("  Off")
20630 OPT FNequb(&D)
20640 OPT FNequw(&1800)
20650 OPT FNequw(&909)
20660 OPT FNequs("No ROM present")
20670 OPT FNequb(&D)
20680 OPT FNequw(&1E00)
20690 OPT FNequs("     ")
20700 OPT FNequw(&D)
```

```
20710 OPT FNequb(5)
20720 OPT FNequs(" Soft break intercept")
20730 OPT FNequs("enabled")
20740 OPT FNequs("disabled")
20750 OPT FNequb(&D)
20760 OPT FNequs("     COM")
20770 OPT FNequw(&D)
20780 OPT FNequb(5)
20790 OPT FNequs(" About to form drive ")
20800 OPT FNequd(&5000D0D)
20810 OPT FNequs(" Press SPACE t continue")
20820 OPT FNequw(&D0D)
20830 OPT FNequs(" OK")
20840 OPT FNequw(&D0D)
20850 OPT FNequs(" tracks   ")
20860 OPT FNequs("split")
20870 OPT FNequw(&D0D)
20880 OPT FNequs("not split")
20890 OPT FNequw(&D0D)
20900 OPT FNequs(" failed track
20910 OPT FNequd(&9000D0D)
20920 OPT FNequs(" disc not empt
20930 OPT FNequw(&D0D)
20940 :
20950 .data2
20960 OPT FNequs("ROM")
20970 OPT FNequb(&D)
20980 OPT FNequs("COM")
20990 OPT FNequb(&D)
21000 OPT FNequs("RON")
21010 OPT FNequb(0)
21020 OPT FNequs("ROFF")
21030 OPT FNequb(0)
21040 OPT FNequs("BON")
21050 OPT FNequb(&D)
21060 OPT FNequs("BOFF")
21070 OPT FNequb(&D)
21080 OPT FNequs("PAGEON")
21090 OPT FNequb(&D)
21100 OPT FNequs("PAGEOFF")
21110 OPT FNequb(&D)
21120 OPT FNequs("SWAP")
21130 OPT FNequb(0)
21140 OPT FNequs("INV")
21150 OPT FNequb(0)
21160 OPT FNequs("SPLIT")
21170 OPT FNequb(0)
21180 OPT FNequs("FORMAT")
21190 OPT FNequb(0)
21200 OPT FNequs("VERIFY")
21210 OPT FNequb(0)
21220 OPT FNequs("BUFFON")
21230 OPT FNequb(&D)
21240 OPT FNequs("BUFFOFF")
21250 OPT FNequb(&D)
21260 OPT FNequs("PURGE")
21270 OPT FNequb(&D)
21280 OPT FNequs("PURGEON")
21290 OPT FNequb(&D)
21300 OPT FNequs("PURGEOFF")
21310 OPT FNequb(&D)
21320 :
21330 .data3
21340 OPT FNequd(&A0D8000)
21350 OPT FNequs("Syntax error")
21360 OPT FNequw(&A0A)
21370 OPT FNequb(&D)
21380 OPT FNequs("*RON/ROFF n (ROM number 0-F)")
21390 OPT FNequb(0)
21400 OPT FNequd(&A0D8100)
21410 OPT FNequs("ROM not present")
21420 OPT FNequb(0)
21430 OPT FNequd(&A0D8200)
21440 OPT FNequs("Buffer not active")
21450 OPT FNequb(0)
21460 OPT FNequs("*FORMAT n (drive 0-3) m (3=35 4=40 8=80)")
21470 OPT FNequb(0)
21480 OPT FNequs("*VERIFY n (drive 0-3)"
)
21490 OPT FNequb(0)
21500 OPT FNequs("*INV/SWAP/SPLIT n (drive 0-3)")
21510 OPT FNequb(0)
21520 OPT FNequd(&A0D8300)
21530 OPT FNequs("Not split")
21540 OPT FNequb(0)
21550 OPT FNequd(&A0D8300)
21560 OPT FNequs("Disc error")
21570 OPT FNequb(0)
21580 OPT FNequd(&A0D1100)
21590 OPT FNequs("Escape")
21600 OPT FNequb(0)
21610 OPT FNequd(&A0D8500)
21620 OPT FNequs("Disc already split")
21630 OPT FNequb(0)
21640 :
21650 .offset
21660 OPT FNequd(&5080104)
21670 OPT FNequd(&3060902)
21680 OPT FNequw(&700)
21690 :
21700 .space2 OPT FNequd(0)
21710 OPT FNequd(0)
21720 OPT FNequd(0)
21730 OPT FNequd(0)
21740 OPT FNequw(0)
21750 .space
21760 ]
21770 NEXT
21780 :
21790 END
21800 :
25000 DEF FNequd(A%)
25010 !P%=A%
25020 P%=P%+4
25030 =J%
25040 :
25050 DEF FNequb(A%)
25060 ?P%=A%
25070 P%=P%+1
25080 =J%
25090 :
25100 DEF FNequw(A%)
25110 ?P%=A% MOD 256
25120 ?(P%+1)=A% DIV 256
25130 P%=P%+2
25140 =J%
25150 :
25160 DEF FNequs(A$)
25170 $P%=A$
25180 P%=P%+LEN(A$)
25190 =J%
```

See 'Easy Driver', page 137

George Hill's View Printer Driver Generator offers you many facilities not available commercially

```
   10 REM View Printer Driver Generator
   20 REM by George Hill
   30 REM for BBC and Electron-Plus1
   40 REM (c) Acorn User June 1985
   50 :
   60 REM **** MAIN PROGRAM ****
   70 :
   80 REM For Electron change next line to MODE 6
   90 MODE 7
  100 HIMEM=&5F00
  110 code=HIMEM
  120 max=14
  130 DIM cli 30
  140 DIM comment$(max)
  150 REM colour definitions for MODE 7
  160 r$=CHR$129:g$=CHR$130:y$=CHR$131:b$=CHR$132:m$=CHR$133:c$=CHR$134:w$=CHR$135
  170 PRINT'w$"VIEW PRINTER DRIVER GENERATOR"
  180 PRINTg$"by George Hill (c)."
  190 PRINT'y$"You can define a new driver or"'y$"edit an existing driver."'
  200 IF FNyn(" Define a new driver") THEN PROCnew ELSE PROCedit
  210 END
  220 :
  230 REM **** PROCEDURES ****
  240 :
  250 DEF PROCnew
  260 new=TRUE
  270 PROCassemble
  280 PROCmake_table
  290 PROCshow_driver
  300 PROCprint_driver
  310 PROCsave_driver
  320 ENDPROC
  330 :
  340 DEF PROCedit
  350 new=FALSE
  360 PROCload_driver
  370 PROCpound_sign
  380 PROCshow_driver
  390 PROCprint_driver
  400 PROCsave_driver
  410 ENDPROC
  420 :
  430 DEF PROCassemble
  440 oswrch=&FFEE
  450 osasci=&FFE3
  460 REM Initialise table contents.
  470 FOR I=0 TO 255
  480 code?I=&FF
  490 NEXT
  500 REM step=3 gives full code output.
  510 step=2
  520 FOR PASS=0 TO step STEP step
  530 P%=code
  540 [
  550 OPT PASS
  560 \JUMP ENTRIES
  570 .start          jmp print
  580 .printer_on     jmp on
  590 .printer_off    jmp off
  600 .hmi            jmp return
  610 .option         jmp return
  620 \FLAG AND STORES
  630 .flag           brk
  640 .acc                       brk
  650 .xreg                      brk
  660 .yreg                      brk
  670 \ROUTINES
  680 .on                        lda #2
  690                            jsr oswrch
  700                            rts
  710 \
  720 .off                       lda #3
  730                            jsr oswrch
  740                            rts
  750 \
  760 .print                     sta acc
  770                            stx xreg
  780                            sty yreg
  790                            lda flag
  800                            beq flag_not_set
  810                            inc flag
  820                            lda acc
  830                            jmp highlight
  840 .flag_not_set              lda acc
  850                            cmp #141
  860                            bne not_141
  870                            dec flag
  880                            jmp restore
  890 .not_141                   cmp #0
  900                            bmi highlight
  910                            cmp #96
  920                            bne print_it
  930                            lda #32
  940 .print_it                  jsr osasci
  950 .restore                   ldx xreg:ldy yreg
  960 .return                    rts
  970 \
  980 .highlight                 and #15
  990                            asl A
 1000                            asl A
 1010                            asl A
 1020                            tax
 1030                            lda table,X
 1040                            cmp #&FF
 1050                            beq restore
 1060                            eor #&80
 1070                            sta table,X
 1080                            and #&80
 1090                            bne set
 1100                            inx
 1110                            inx:inx:inx
 1120 .set                       lda table,X
 1130                            and #&3
 1140                            tay
 1150                            inx
 1160 .sloop                     lda #1
 1170                            jsr oswrch
 1180                            lda table,X
 1190                            jsr oswrch
 1200                            inx
 1210                            dey
 1220                            bne sloop
 1230                            jmp restore
 1240 .table
 1250 ]
 1260 NEXT
 1270 REM Code should be 138 bytes long at this point.
 1280 IF table<>code+&8A THEN PRINT"Code length is ";P%-code;" bytes."'"It should be 138 bytes."'"Please check and try again.":VDU7:STOP
```

```
 1290 REM This leaves 117 bytes for the
table.
 1300 ENDPROC
 1310 :
 1320 DEF PROCmake_table
 1330 PROCpound_sign
 1340 offset=0
 1350 no_more=FALSE
 1360 skip=FALSE
 1370 REPEAT
 1380 PROCget_codes
 1390 UNTIL offset=8*max OR no_more
 1400 PROCinit_code
 1410 ENDPROC
 1420 :
 1430 DEF PROCget_codes
 1440 CLS
 1450 PROCcontrol_codes("set")
 1460 IF no_more THEN ENDPROC
 1470 IF skip THEN skip=FALSE ELSE PROCc
ontrol_codes("reset")
 1480 IF offset<0 THEN offset=0
 1490 ENDPROC
 1500 :
 1510 DEF PROCcontrol_codes(P$)
 1520 PRINT'w$"HIGHLIGHT CODE DEFINITION
"
 1530 PRINT 'c$;"Definition of highlight
 code ";128+offset DIV 8
 1540 *FX229,1
 1550 REPEAT
 1560 IF P$="set" AND new THEN PRINT m$;
"Press + to skip forwards,"'m$"       - t
o skip backwards."'m$"Type END to finish
 definition."'g$; ELSE IF P$="set" PRINT
 g$; ELSE PRINT r$;
 1570 PRINT"How many bytes to "P$" this
 code ";:INPUT N$
 1580 IF P$="set":IF N$="END" THEN no_mo
re=TRUE
 1590 IF P$="set":IF N$="+" THEN offset=
offset+4:skip=TRUE
 1600 IF P$="set":IF N$="-" THEN offset=
offset-12:skip=TRUE
 1610 IF NOT (skip OR no_more) THEN FOR
I=1 TO 3:I?(table+offset)=&FF:NEXT
 1620 N=VALN$
 1630 valid=N>0 AND N<4 AND N=INT(N)
 1640 UNTIL no_more OR valid OR skip
 1650 IF no_more OR skip THEN 1780
 1660 table?offset=N
 1670 PRINT" Now type in characters to "
P$" ";128+offset DIV 8
 1680 PRINT" Use ESCAPE and CTRL keys as
 necessary."
 1690 FOR I=1 TO N
 1700 get=GET
 1710 table?(offset+I)=get
 1720 PROCoutput_sequence(get)
 1730 NEXT
 1740 PRINT
 1750 IF NOT FNyn("Are these correct") T
HEN 1530
 1760 IF P$="set" THEN INPUT"Enter 4 cha
racter comment :"comment$(offset DIV 8)
 1770 comment$(offset DIV 8)=LEFT$(comme
nt$(offset DIV 8),4)
 1780 *FX229,0
 1790 offset=offset+4
 1800 ENDPROC
 1810 :
 1820 DEF PROCinit_code
 1830 table?112=2
 1840 table?113=27
 1850 table?114=64
 1860 table?116=1
 1870 table?117=0
 1880 comment$(max)="INIT"
 1890 ENDPROC
 1900 :
 1910 DEF PROCoutput_sequence(n)
 1920 REM To produce a screen appearance
 for control codes.
 1930 REM Control characters have ^ in f
ront of them.
 1940 IF n=27 THEN PRINT" ESC";
 1950 IF n<>27 AND n<32 THEN PRINT" ^"ST
R$n;
 1960 IF n=32 PRINT" SP";
 1970 IF n>32 AND n<255 THEN PRINT" "CHR
$n;
 1980 IF n=255 THEN PRINT" |";
 1990 ENDPROC
 2000 :
 2010 DEF FNyn(prompt$)
 2020 PRINTprompt$;" ? (Y/N)";
 2030 REPEAT
 2040 Z=GET AND 223
 2050 UNTIL Z=ASC"Y" OR Z=ASC"N"
 2060 PRINTCHR$Z
 2070 IF Z=ASC"Y" THEN =TRUE ELSE =FALSE
 2080 :
 2090 DEF PROCsave_driver
 2100 PROCadjust_driver
 2110 CLS
 2120 PRINT'w$"SAVING DRIVER:"'
 2130 INPUT" Type in name for driver "F_
N$
 2140 PROCOSCLI("SAVE "+F_N$+" "+STR$~co
de+" +100 400 400")
 2150 ENDPROC
 2160 :
 2170 DEF PROCadjust_driver
 2180 FOR I=0 TO 137
 2190 IF code?I=HIMEM DIV &100 THEN code
?I=&04
 2200 NEXT
 2210 ENDPROC
 2220 :
 2230 DEF PROCshow_driver
 2240 CLS
 2250 PRINT'w$"SHOWING DRIVER:"
 2260 PRINT'g$"A full representation of
the highlight"'g$"codes defined so far w
ill now be shown."
 2270 printer=FNyn(" Do you want output
to printer")
 2280 IF printer THEN VDU12,2 ELSE VDU12
 2290 PRINT'y$"CODES DEFINED"
 2300 FOR I=0 TO max
 2310 PRINT TAB(1,I+3)"HT ";128+I;TAB(9,
I+3);
 2320 FOR J=1 TO 3
 2330 PROCoutput_sequence(?(table+8*I+J)
)
 2340 NEXT
 2350 PRINT TAB(20,I+3);
 2360 FOR J=5 TO 7
 2370 PROCoutput_sequence(?(table+8*I+J)
)
 2380 IF I=max THEN J=7
```

Continued ▶

◀ Continued

```
2390 NEXT
2400 PRINT TAB(35,I+3);
2410 PRINT" "comment$(I)
2420 NEXT
2430 VDU3,10
2440 IF NOT FNyn("Are these correct") T
HEN PROCedit_driver:GOTO 2240
2450 ENDPROC
2460 :
2470 DEF PROCprint_driver
2480 VDU12
2490 PRINT'w$"PRINTING DRIVER:"
2500 PRINT'c$"The listing produced by t
his procedure"'c$"is only useful if you
have made"'c$"comments on all codes defi
ned."'
2510 IF NOT FNyn(" Show codes on printe
r") THEN ENDPROC
2520 *FX3,10
2530 PRINT''"ASCII CODE...CHARACTERS...
.....COMMENT"
2540 FOR I=0 TO max
2550 PRINT"    ";128+I;"         ";CHR$(64
+I);"  "CHR$(80+I);"  "CHR$(96+I);"  "CH
R$(112+I);"  "CHR$(48+I)"       "comment$(
I)
2560 NEXT
2570 *FX3,0
2580 *FX15,1
2590 ENDPROC
2600 :
2610 DEF PROCOSCLI($cli)
2620 X%=cli MOD 256
2630 Y%=cli DIV 256
2640 CALL &FFF7
2650 ENDPROC
2660 :
2670 DEF PROCedit_driver
2680 N$="":valid=FALSE:no_more=FALSE
2690 PRINT''"Which one do you want to ed
it?"
2700 REPEAT
2710 INPUT"Give code - 128 to 142 "htco
de$
2720 htcode=VAL(htcode$)
2730 OK=htcode=INT(htcode) AND htcode>1
27 AND htcode<143
2740 IF NOT OK THEN VDU7
2750 UNTIL OK
2760 offset=(htcode-128)*8
2770 PROCget_codes
2780 ENDPROC
2790 :
2800 DEF PROCload_driver
2810 CLS
2820 PRINT'w$"LOADING DRIVER:"
2830 PRINT'c$"Type in the name of the d
river to edit"'c$"or type"w$"*CAT"c$"for
 a list."'
2840 REPEAT
2850 INPUT" Filename ",F_N$
2860 IF LEFT$(F_N$,1)="*" THEN PROCOSCL
I(F_N$):PRINT:GOTO 2850
2870 ch=OPENUP(F_N$)
2880 CLOSE#ch
2890 IF ch=0 THEN PRINTCHR$7;r$"NO SUCH
DRIVER."
2900 UNTIL ch<>0
2910 PROCOSCLI("LOAD "+F_N$+" "+STR$~co
de)
2920 N$="":offset=0:skip=FALSE:no_more=
FALSE
2930 table=code+&8A
2940 ENDPROC
2950 :
2960 DEF PROCpound_sign
2970 CLS
2980 PRINT'w$"POUND SIGN:"
2990 PRINT'g$"The keyboard pound key ge
nerates"'g$"ASCII code 96. The default s
etting is"'g$"for this to be replaced by
 a space."'g$"This gives a ""pad"" chara
cter."
3000 PRINTg$"Type"w$"RETURN"g$"key for
this option."
3010 PRINT'g$"You can make the"w$"`"g$"
key give the"'w$"`"g$"sign on the printe
r by entering the"'g$"ASCII code for the
printer's"w$"`"'g$"character now."'
3020 REPEAT
3030 INPUT" Type in ASCII code or <RETU
RN>"ps$
3040 ps=VAL(ps$)
3050 UNTIL ps$="" OR (ps>=0 AND ps<256)
3060 IF ps$<>"" THEN ?(code+&4C)=ps
3070 ENDPROC
```

Dynamic Function Key Strip, Beeb Forum, page 115

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

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BAR CODE OFFER



KEEP UP WITH THE KIDS IN SCHOOL

BAR CODES will revolutionise the way we use computers in applications as well as the way we load data. Here is the chance to get experience of this important development by ordering the Addison Wesley/MEP Bar Code Teaching Pack (see our January issue, page 129) direct through *Acorn User*.

These bar code readers are being offered to schools first and versions will not be available to the public in the shops until later in the year – when they will certainly cost more. However, because of its active involvement in the scheme *Acorn User* is able to offer the Teaching Packs direct to readers at the introductory price of £49.95 plus £2.95 post and packing (plus VAT).

Acorn User will be printing some listings in bar code format in each issue and making booklets of bar codes available by mail order.

Book publishers are already printing listings in bar code format, in fact Bruce Smith's latest book *The BBC Micro Machine Code Portfolio* has 13 pages of bar code listings.

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Date ....

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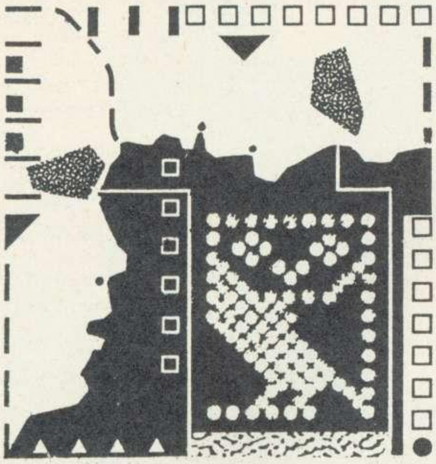
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Bruce Smith presides over this month's forum and we tell you about a forthcoming feature – hints and tips for wordprocessor users

Don't be overlooked for the Forum

MANY good submissions are being sent into Beeb Forum without an accompanying cassette tape or disc. While this is not a problem with very short programs or routines, it is with longer items.

Please enclose your program on a suitable medium if it is of a reasonable length, otherwise it will almost certainly be overlooked. As a rough guide; programs that take more than a couple of minutes to type in should be supplied in a machine readable form. Unfortunately we are unable to return submissions to Beeb Forum.

£10 Wordwise colour with embedded commands

FOLLOWING on from last month's tip by Miranda Williams regarding creating text screens using *Wordwise,* John Martin from London has found a way of adding 'new' embedded commands to *Wordwise* that can be used to clear screens and add colour (listing 1). John explains...

It is not possible to introduce colour codes directly into a *Wordwise* text because *Wordwise* filters them out from the keyboard. However, it is possible to introduce new embedded commands, as *Wordwise* ignores any commands it does not recognise. (*Wordwise Plus* does not – BS.)

Wordwise stores the green colour command code as &02, and the white end of command code as &07 in the file. Using a Basic program to read the file, these bytes can be tested for, and a command extracted from the text.

The program assumes that the command is two letters long and can be followed by a number. For example, BC4 results in a blue background, while TC3 results in yellow text.

If there is a number only, then only the rest of the line is coloured, otherwise the text is continuously coloured.

Further commands (such as CS – clear screen before continuing, and GT – wait before continuing), can be invented.

As I mentioned above, embedded commands cannot be caught in this manner if you are using *Wordwise Plus*, as unrecognised commands will generate a 'Mistake' error. However, I've no doubt that some astute reader will have the answer...

£5 Wordwise Plus program compactor

WHILE on the subject of *Wordwise Plus*, a submission has arrived from R Bunnett of Kent. It is a segment program compactor (listing 2), written in the *Wordwise Plus* programming language. It should be loaded into Segment 9 and when run with Shift-9, the segment to be compacted will be prompted for. The compactor strips REMs, double spaces, Return spaces and LETs, and should be of great value when memory is getting tight.

Can someone think of an apt name for the *Wordwise Plus* programming language, which is such a mouthful? A fiver for the best name sent in to me!

£5 Initialising ROMs solution

M R REYNOLDS of Hampshire provides the answer to how to initialise ROMs by mimicing the power on reset. Mr Reynolds writes...

It seems to be generally believed that battery backup is required to operate some ROMs in a sideways RAM. This is because they need a power-on reset to initialise them. However, a power-on reset may be simply performed by typing:

```
*FX 151,78,127
```

and then pressing the Break key.

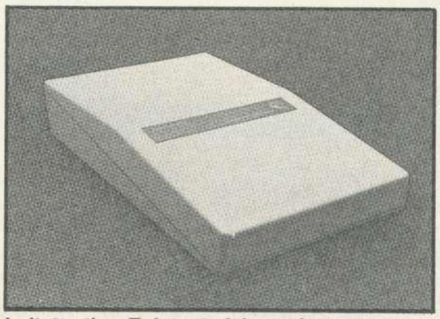
Obviously the same operation may be performed from Basic by replacing the 'Break' with a call to &D9CD. Also, in assembler:

```
LDA #&97
LDX #&4E
LDY #&7F
JSR &FFF4
JMP &D9CD
```

This may be useful for software protection, as a hard reset removes all traces of the program.

£10 On screen function key strip

USERS of the Teletext Adaptor will be familiar with the displaying of a 'function key strip' across the bottom of the



Imitate the Teletext Adaptor's on screen function key strip with Dr Osborne's routine

screen display. Dr Osborne from Swansea provides a short routine that produces a similar dynamic function key strip on the screen. The program could form part of your normal boot file. Dr Osborne explains...

There have been a number of short

Beeb Forum is a platform for ideas, tips and applications relating to the BBC micro and the Electron, intended for experienced programmers to share their thoughts. For every reader's tip published we pay £5 – or more for something special. Contributions should be typed or printed, with substantial listings on cassette. WRITE TO Beeb Forum, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

programs published that enable function key strips to be produced on a printer. These can then be slipped under the transparent ruler at the top of the keyboard to remind the user of various key functions.

These strips, although useful, have one serious drawback – they are static; once a strip has been designed it remains under the ruler until it is removed. This can be particularly annoying if the program uses the same function keys to perform different actions at various stages. For example, at start-up the function keys may be used to select an item from a menu supplied. Later on, the same keys may be used to perform specific functions that are defined by the sub-program called up originally.

The program (listing 3) allows the user to vary the contents of the function key strip presented at the bottom of the screen. By varying the value of N%, 1 to 4 levels of functions can be displayed for each key. All that the user need do is to put into an array, f$(I,J) (where I extends from 1 to N% and J from 0 to 9), the information that is to appear in the key strip for each of the function keys 0 to 9. The maximum length that f$(I,J) can be is four characters but, of course, these characters can be an icon designed using VDU23. Calling PROCfk will then draw the strip on the screen and set the screen text window to a size which ensures the strip will not be overwritten.

£10 All change for control codes

MIRANDA Williams has come up with a useful program that certainly makes my life easier when preparing program listings for *Acorn User*. It's a program to convert embedded control codes inserted into text with the <Shift–fkey> into the correct CHR$n format.

To use the program (listing 4), it is first necessary to obtain the program in the form of a text file. It then detects all characters in the range 129 to 159 and character 255, and replaces them with the string "CHR$*###*", where *###* is the ASCII value of the character.

The full procedure is:

1 LOAD"basic-program"
2 *SPOOL filename
3 LIST
4 *SPOOL – the program is now in text form in the file "filename".
5 * CHAIN "DOCTOR" – and respond to the prompts for input and output filenames.
6 To re-constitute the program as tokenised Basic, follow the final prompt and *EXEC it.
7 Save the new version.

There are two warnings. First that the lines grow in length and there is the possibility of producing overlength lines. Second that the program also grows! So if memory is short, beware.

£5 Three-dimensional textured printing

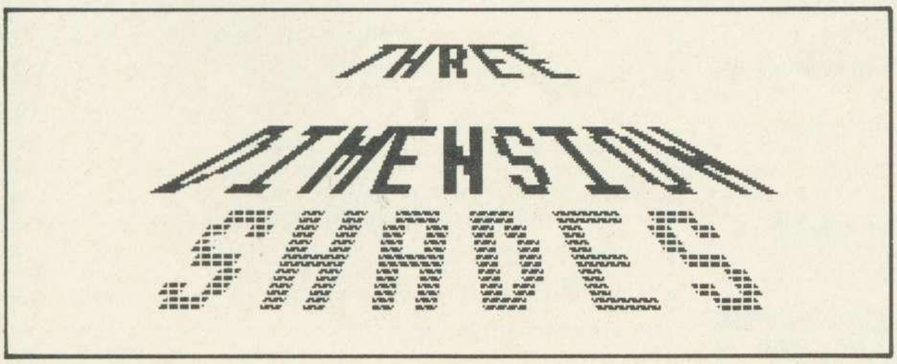
SHAKIR ABBAS writes from North London with an enhancement to Graham Walkden's *Superprint* program printed in the July 1984 issue...

Graham Walkden's program enabled you to print enlarged text in any position and/or angle in any graphics mode, by printing the message to be placed on the screen and using the POINT command to sense whether a pixel was to be plotted or not.

I have extended the program (listing 5) so that every pixel that is to be plotted is subtracted by one to give a three-dimension effect.

In addition, if the size of the print is set to over five units, different texture printing can be used.

For example if XMAG% (X magnification) is set to five and YMAG% (Y magnification) is set to six it would print a certain type of texture.



Shakir Abbas' three-dimensional characters and textured printing

WORDPROCESSOR USERS

We're starting a new section of hints and tips for wordprocessor users, so if you've got any routines to pass on to other readers or questions you'd like answered, write to Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

£5 Load and save Aries screen memory

SCREEN memory RAM boards are always a popular addition to the fibreglass menagerie held with the casing of most Beebs – the Aries B20 board being a favourite of many. N L Smith of Stoke-on-Trent has one installed, and explains how screen memory can be *LOADed and *SAVEd...

When the board is activated the Aries RAM is used for the screen display and the BBC RAM for the part of the program which extends above &3000. Presumably because of its method of paging these RAM areas, a normal *SAVE or *LOAD of the screen doesn't work, in fact the commands save or load the RAM areas containing the program space.

When the B20 is activated it takes one page of user RAM as workspace, so that the base address is increased by &100, and it sets HIMEM to &8000 in all screen modes. Either of these parameters can be used to set a flag which activates the additions to a program (listing 6) to allow a *SAVE or *LOAD of a screen.

Line 10 detects the added &100 or line 30 the value of HIMEM and sets a flag which is used in the *SAVE and *LOAD procedures to switch the memory areas using the official call *FX111,n, where 0 is for normal BBC RAM and 1 for the B20 RAM area.

After the *commands have been carried out, the areas are again swapped back to the normal RAM area of the activated B20. You must include the flags even if the board is not activated, otherwise use of *FX111,n causes a 'Bad command' error. *FX111,n is normally used by the board to store two separate areas of data for certain types of program.

Of course, if PAGE or HIMEM is changed for any other reason, the appropriate changes must be made to the parameters to set the flag.

The six listings for Beeb Forum are on yellow pages 100–101

NEW TWISTS TO SIDEWAYS RAM

Richard Harris opens a three part series of utilities for use with sideways ROM extension boards

WITH an ever-increasing number of ROMs (or EPROMs) available, many of you will have fitted a ROM extension board. Virtually all have facilities for one of the ROMs to be replaced by RAM chips. Although the commonly used 8k RAM chips have halved in price recently, it will still cost about £40 for 16k. Why bother? Is it worth is? Yes!

When developing your own sideways ROM software, it's ideal for trying out routines before 'blowing' an EPROM. If you are writing long machine code programs and running out of memory during assembly, then with Basic 2 simply assemble the code into the sideways RAM (via O% and P%) and save 16k for the program and variables. A simple routine (see later) will extract the code from the RAM.

There are, however, several interesting uses of sideways RAM which employ the BBC micro's sideways ROM software and the fact that it is in RAM. This short series will give you software for the following:

1 Safe DFS operations: *COPY, *BACKUP, *BUILD and *COMPACT all destroy any program or data already in memory. This routine uses the sideways RAM to prevent this.

2 Disc formatting and verifying routines which do not corrupt main memory.

3 Dual catalogue routines to give 61 files on a disc. Safe swapping between catalogues and display of both catalogues at once are provided.

4 11k printer buffer with full OS support. This alone will save the price of the RAM chips.

"When developing your own sideways ROM software it's ideal for trying out routines before 'blowing' an EPROM"

5 ROM handling routines.

6 Facility to enter 'paged mode' whenever mode 0 is selected. This is very useful when previewing text with *Wordwise*; better than the method used by the more recent versions of this word-processor.

7 Full *HELP and error handling.

8 How to add your own routines.

1 and 4 use the same area of the RAM, so they can't be used together.

First, a note about sideways ROM boards. Most are arranged so that the RAM is 'ROM' number 15, that is, the highest priority ROM. Data in the RAM-ROM can be read only when ROM 15 is selected. However, any write operation to the ROM area (&8000 to &BFFF) will write to the RAM-ROM irrespective of the ROM selected. This allows data on disc or tape to be written to the RAM easily. If write was also possible only when ROM 15 was selected it would be difficult to do this: the DFS ROM is selected with disc systems and the language ROM with tape.

Unfortunately there are problems with this simple state of affairs. Many commercial ROMs will corrupt the sideways RAM – they have a rather pathetic protection system to prevent them being copied and used in sideways RAM systems. This involves writing to one byte within the ROM and seeing if the contents are changed. Obviously, if in ROM it will not be; but if in RAM it will be. If the value is changed the ROM will refuse to operate.

There are several ways around this. Remove all offending ROMs; but this is not very practical. Use a write protect switch; this is OK if you are developing ROM software but useless if you are using the RAM-ROM as RAM. Fortunately most of my ROMs only corrupt the RAM when initially selected; temporary write protection will work with these though it is annoying and easily forgotten. It will also make the printer spooler lose track since it will be unable to update its pointers. Some ROMs are even worse, particularly utility ROMs.

The ideal answer is to have an additional addressing mode for the sideways RAM; read *and* write only when ROM 15 is selected. This is not yet available on ROM boards as far as I know but hopefully will be. I have been able to modify the board I use.

Another addition is a disable switch; when set this will prevent the BBC Operating System (OS) seeing any data in ROM 15 (ie, the RAM) on reset. This can be necessary if incorrect code in the RAM locks up the computer – it is the only way to avoid switching off!



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Sideways RAM software

The software provided this month is in three parts. First, the initial few bytes of the 'ROM' to tell the OS that a ROM is present and what sort it is. Full details of this can be found in the *Advanced User Guide* or Bruce Smith's new book, *The BBC Micro ROM Book*.

The essentials relevant to this project are:

&8000,1,2 JMP to language entry; not needed
&8003,4,5 JMP to service entry; must be present
&8006 ROM type
bit 7 set if service entry (must have one as the Basic ROM is recognised by not having one)
bit 6 set if language selectable on hard reset
bit 1 must be set
&8007 copyright offset (= yy)
&8008 version number
&8009 to &80xx title string; will be printed if selected as language or can be with *HELP terminated with &00
&80xx + 1 to &80yy optional version string
&00
&28 "("
&43 "C"
&80yy + 3 &29 ")"
&80yy + 4 to &80yy + n copyright message

The actual code follows this last address and is in two parts – the routines and the data need by them.

Service entries

Before describing this month's routines we must deal with the service entries to the ROM. At various times the OS enters each paged ROM in turn; 15 first, 0 last. It does this at the service entry point, giving the ROMs the chance to respond to various circumstances. The value in the accumulator controls which type of service is required; the X and Y registers may contain further information.

Two exits are possible after a service has been dealt with: all the registers are restored so that other ROMs can also perform the service (.end in the program) or the accumulator is set to zero – this stops further action by other ROMs (.stop in the program). A few calls (not used in this series) restore the accumulator and X register but modify the Y register.

The service entries we will be using are:

A = 3 Auto-boot, ie, initialise on hard or soft Break: used mainly by filing systems. Used to reset various flags and to check which ROMs are present in the computer. *page 122* ▶

WHAT IS SIDEWAYS RAM?

TO ANSWER this we need to understand a few of the concepts involved in the way the Beeb uses the area of its memory which holds the Basic chip itself.

You'll probably be familiar with ROMs that can be added into one of the vacant sockets underneath the left-hand side of the keyboard. Examples include Toolkit ROMs used to enhance Basic, eg ADDCOMM and *Caretaker*, wordprocessors such as *Wordwise* and *View*, and languages, including Forth, Pascal, and Comal. What all these items of firmware (that's what we call software in the form of a ROM) have in common is that they all occupy the same area of memory as the Basic ROM itself! The figure below shows this diagramatically. The ROMs are parallel with one another and sit side-by-side – hence the term sideways ROMs.

The next question you may ask is how can they work together if they all occupy the same space? The answer is that as each sideways ROM is needed it is switched in circuit while the last one in use is switched out of circuit – this switching is done by the MOS and as such is software controlled. ROMs can therefore be paged as required simply by issuing a suitable command that will be recognised by the ROM concerned.

With a language ROM, or indeed a wordprocessor, it is normally selected with a command, eg *WORD or *PASCAL, and then stays in circuit so that you can make use of it full time. Of course you cannot now use Basic.

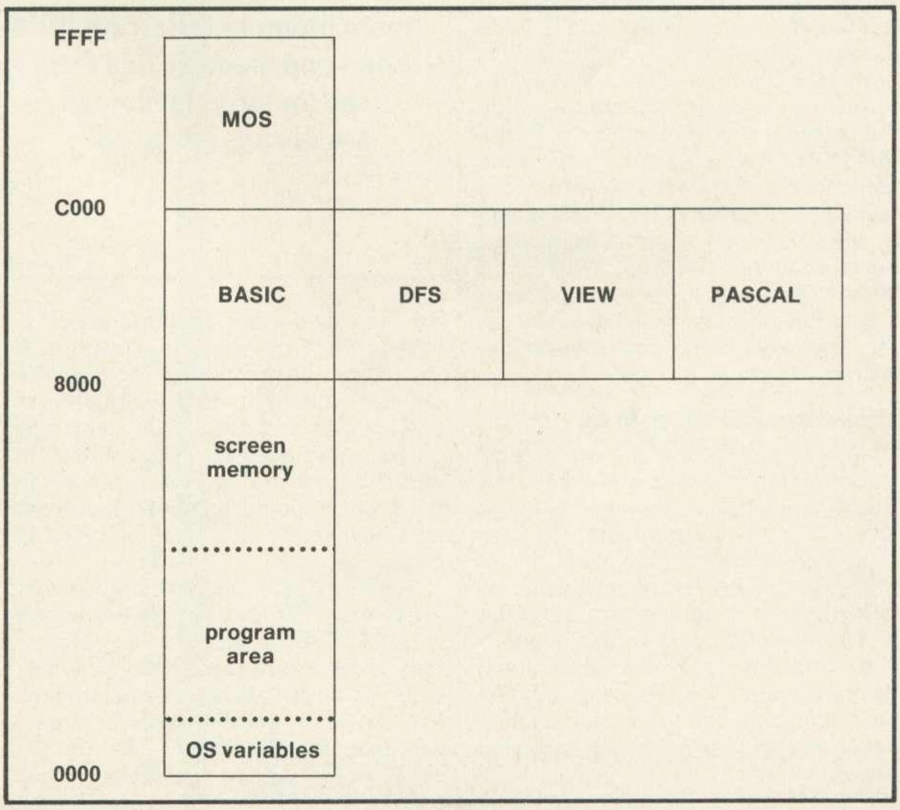
Toolkit ROMs operate slightly differently as they are normally used from within Basic or a Basic program. An example is a command called *PACK that would compact a Basic program to its smallest form. In this instance the ROM containing the command would be paged in, the command executed, and then control returned to Basic. In many respects you could think of it as calling a PROC in a ROM.

Sideways RAM is really what its name says – RAM 'plugged' into a sideways socket. This is simplifying the process somewhat as you cannot simply purchase a RAM chip and plug it in – you need to buy a circuit board that is capable of supporting sideways RAM.

The two most common methods are to install a dedicated sideways RAM board such as the Solidisk or Ramamp boards, or a sideways ROM board that has space for sideways RAM. In many respects the latter is preferable as it allows you to use any existing sideways ROMs in addition to sideways RAM. Most ROM boards allow you to insert RAM chips in one or two sockets (for example the APTL or Exmon board). See the ROM board review in the April issue and turn to page 7 for details of the new *Acorn User* sideways RAM chip.

The cost of adding RAM chips varies depending on the specification laid down in the manual with the ROM board, but £20 will normally be enough.

Providing machine code programs adhere to a special format, it's possible to write your own software which can be *LOADed into the RAM and used in the form of * commands. So if you want to learn just how to do this and include your favourite *Acorn User* programs in sideways RAM then read on ....



Sideways ROM

A = 4 Unrecognised command, ie, a * command has been issued which the OS does not use. The paged ROMs are first given the chance to recognise it, then the current filing system. Note that filing systems that are in paged ROM will therefore be offered the command twice; more on this later. The command will be an ASCII string ending in &0D, indirected to by the contents of &F2,&F3 plus the Y register (ie, read with LDA (&F2),Y). The routine provided allows upper or lower case letters, but no abbreviations.

A = 6 'Break'; a BRK instruction has been executed. Allows paged ROMs to tidy up if an error occurs (including Escape key action). Used to restore main memory from paged RAM if error occurs in DFS routine before its end. More on this next month.

A = 9 A *HELP command has been issued. Further keywords (eg, *HELP UTILS) may be pointed to by &F2,&F3 plus Y. If not (&0D pointed to) the ROM should print its name and any keywords it will respond to. If there is a keyword, the *HELP should be ignored unless the ROM recognises it; then it should print the appropriate information.

These are all the service routines that we will be using. As well as these services there are two other entries into paged ROMs – the language entry, not relevant to this project, and the extended vectors which will now be dealt with.

The software this month provides a simple *HELP plus three utilities. The first is a means of bypassing the RAM software. This is done by putting a 'Y' in front of the command; this is simply 'removed' by increasing the pointer value and passing the command on to the next ROM. This is useful if one of the commands in the RAM software is the same as in another ROM. *PURGE will be one of our new commands; to pass this to another ROM type *YPURGE. It can also be useful if you want to pass a command to a ROM as quicky as possible. The recognition code will be bypassed.

Sideways ROM vectors

An important aspect of sideways ROM programming is how to cope with vectors, ie, when the code pointed to by the vector is in a sideways ROM. This has to be more complex than normal vectors since the correct ROM has to be selected before jumping to the code. Just how the OS deals with this is well worth looking at if you understand machine code. The two other utilities this month both use the vector system. The practical details of how to set up these vectors is:

1 Each vector has a number, N, which can be found in the User Guide. Normally vectors exist in memory from &200; since each uses two bytes, the exact location of a vector will be &200 + 2*N. The 'write character' routine, OSWRCH, uses the WRCHV vector, number 7. This vector is at &200 + 2*7 = &20E.

2 The main vector, as found above, must be pointed to the OS routine for handling sideways ROM vectors. This is done by making the vector point to &FF00 + 3*N. With WRCHV this will be &FF00 + 3*7 = &FF15.

3 The OS keeps a table of any vectors that are using sideways ROMs. The location of the table in OS1.2 is &D9F – but this should be checked using OSBYTE &A8 (address in X and Y registers). Three bytes are stored in the table for each vector:

address in ROM (low byte)
address in ROM (high byte)
ROM number

The ROM number can be found in location &F4 when the ROM is setting up its vectors. The final point is where to put these bytes within this table:

(address returned by OSBYTE &A8) + 3*N

"One important feature of all the routines is that no main memory is corrupted. When any memory has to be used the original values are always restored"

Another important consideration is how to exit from the vector routine. If the ROM code completely replaces the OS routine then an 'RTS' instruction is correct. Sometimes the ROM code only partially replaces the OS routine. In these cases the original vectors in &200 + 2*N should be saved and used as a new vector at the end of the ROM code.

The first of the utilities using vectors intercepts WRCHV, and enters paged mode whenever mode 0 is selected. This gives a very convenient 'preview' when using *Wordwise*. The commands are *PAGEON and *PAGEOFF. 'Break' will reset to PAGEOFF. The routine could be extended to select black text on a white background.

The other utility is the printer buffer. This involves three vectors:

1: Buffer insert vector
This routine is used to insert characters into any of the micro's buffers, eg, keyboard, sound, printer. The value in the X register defines which buffer is involved; 3 is the printer buffer. The character to be inserted is in the accumulator (A). On exit from the routine the carry flag (C) is set if insertion failed because the buffer was full.

2: Buffer remove vector
This has two functions – to remove a character from a buffer or just examine what the next character will be. X determins which buffer, while the overflow flag (V) controls which function. If V is set an examination will occur; if V is clear a character will be removed. On exit, A contains the *examined* character, Y the *removed* one. If the buffer was empty C will be set on exit.

3: Buffer count/purge vector
As before, X is the buffer number. Three functions can occur – purging (ie, emptying) the buffer, counting the number of characters in the buffer and counting the amount of space left. Which is controlled by V and C.

V = 1	Purge buffer
V = 0 C = 1	Space left in buffer
V = 0 C = 0	Characters in buffer

On exit, the count value is in X (low byte) and Y (high byte).

The routines supplied follow these protocols. If on entry the buffer involved is not the printer, control is returned to the normal OS routines. The only features not implemented are the buffer full and buffer empty events.

The commands are:

*BUFFON	turn buffer on
*BUFFOFF	and off
*PURGE	empty buffer
*PURGEON	
*PURGEOFF	

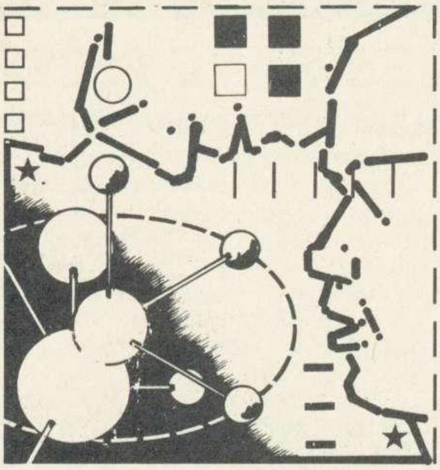
The latter two control the effect of the Escape key, *FX15, *FX21, etc. Normally these purge buffers, but with large buffers this can be disastrous and would limit the usefulness of the buffer considerably. The purging action of these commands are therefore disabled unless deliberately turned on with *PURGEON.

ADVAL(−4) can be used from Basic to find the amount of space left.

One important feature of all the routines is that no main memory is corrupted. When any memory has to be used the original values are restored.

Next month I'll deal with the various disc utilities.

The listings for Richard Harris's utilities are on yellow pages 102-107



Mike Barwise presents your Atomic theories – three ways to make the reset function reliable and a useful hex/ASCII dump

£5 Making reset reliable

SEVERAL readers have been in touch concerning the unreliable reset (Break) function on the Atom. The most common problem is the necessity of hitting Break after power-up to initialise the system for the first time, but others include system crashes on Break (ie, the failure of the reset routine to operate properly) and welding or failure of the Break switch contacts.

The Atom Break key is used to discharge a capacitor (C11) which has

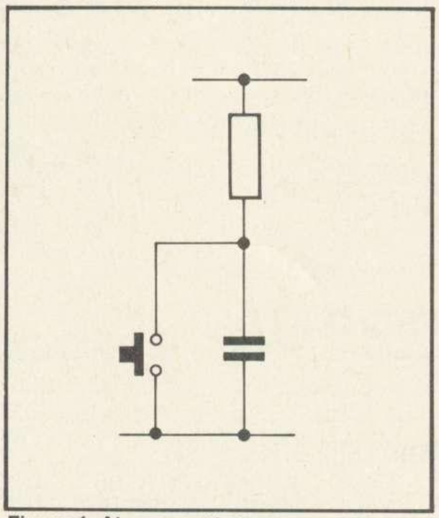


Figure 1. Atom reset button

been charged up through a resistor (R38) to Vcc. The RESET line to the CPU and peripherals is coupled to the junction of the capacitor and resistor (figure 1). It must be remembered here that the 6502 RESET line requires a rising edge signal (low to high transition) to initialise its internal reset handling. Taking the line low is only a preliminary to this transition.

Theoretically, as the capacitor is discharged while the Atom is switched off, the voltage on the capacitor should rise more slowly than the supply voltage due to the charge delay through the resistor, forcing the RESET line to stay low during power-up. The Atom is reset when the capacitor voltage makes the transition through the TTL threshold voltage after the power supply voltage is stable.

It is, however, an extremely unreliable approach in practice, as the capacitor would have to be rather large and the resistor value high to ensure that the power supply voltage has sufficiently stabilised before the RESET line goes high. This would preclude the required transition speed from low to high to ensure proper reset by introducing a 'grey area' where the capacitor voltage spends time in the region of the TTL threshold voltage.

When the Break key is hit, the capacitor discharges directly through it to ground. On release of the key, the capacitor is recharged exactly as if during power-up. The same considerations therefore apply to the reliability of the reset, but in addition, the large capacitor discharges through the negligible resistance of the switch, causing a current surge which can at worst weld the contacts, and in any case will shorten the life of the switch.

£5 is on its way to Malcolm Constantine of East Grinstead who has suggested the fitting of a low value resistor in series with the reset key capacitor (figure 2) to reduce the current surge through the key switch contacts. This has the advantage of being easy, cheap and not irrevocable. It would help stave off switch failure, but, bearing in mind that the reset line buffers are not schmitt type, there will be an increased likelihood of 'grey area' in the reset pulse rise and fall. This could exacerbate the failure of the reset routine to operate properly.

A neat alternative, sent in by R J

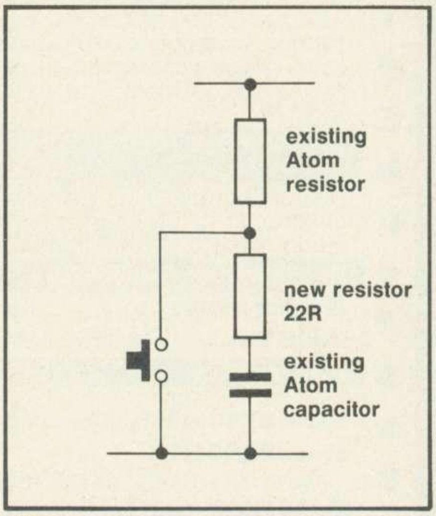


Figure 2. Reducing current surge on an Atom reset button

Parsons of Whitton in Middlesex and earning him £5, uses a micropower relay to simulate Break key operation during reset (figure 3). Basically, the very large capacitor and high resistor value required for proper reset as in figure 1 have been routed through the relay, eliminating the loading on the Break key on subsequent operation.

However, an additional complication has been introduced, in that the charge resistor and relay coil constitute a potential divider, which means that the maximum voltage at the top of the capacitor is now less than the supply voltage by the ratio of the divider. This imposes a limitation on the value of the charge resistor, which must be of the same order as the value of the relay coil resistance.

Bearing in mind the approximate three volt minimum operate voltage of

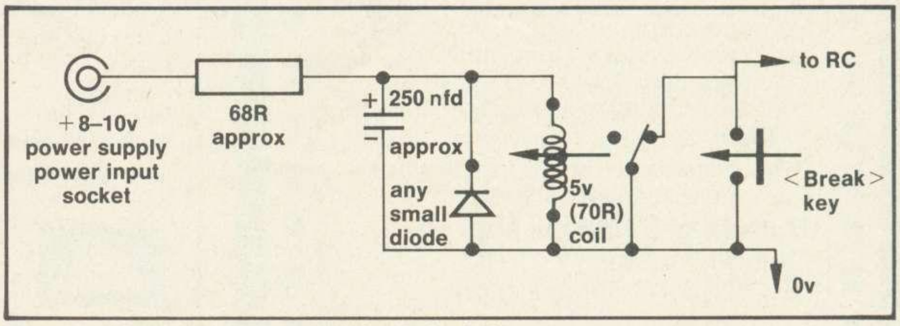


Figure 3. A Break key during reset circuit simulation

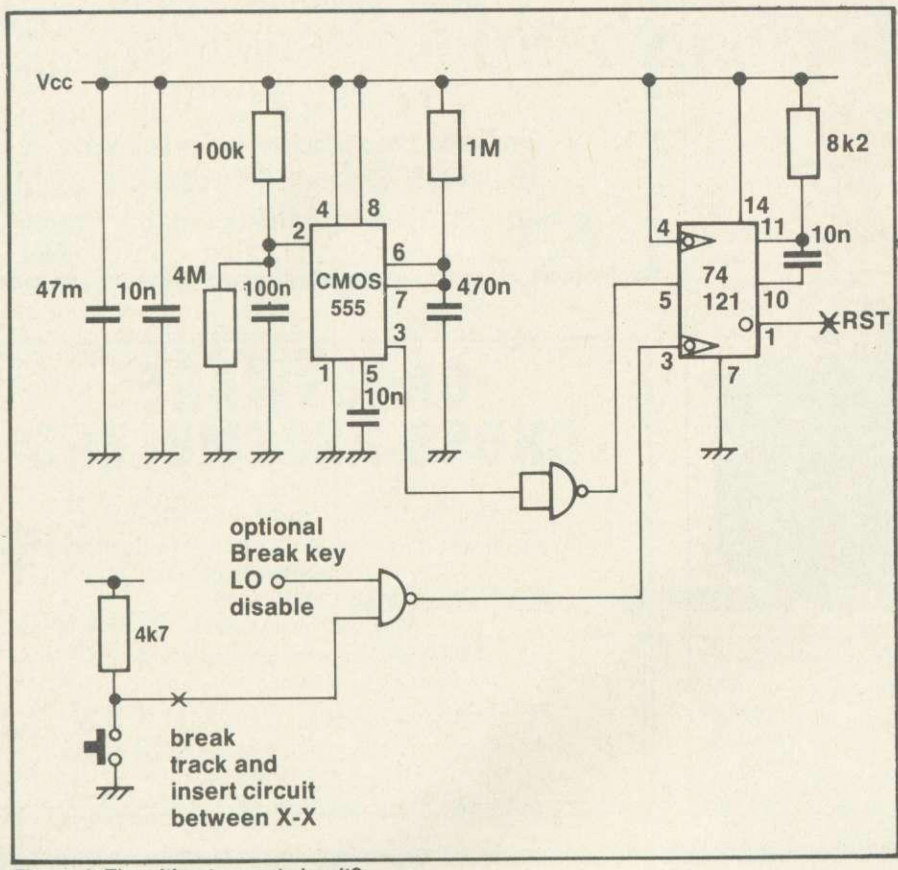


Figure 4. The ultimate reset circuit?

the relay, and its coil resistance of about 70 ohms, Mr Parsons' component values are valid provided you tap the unregulated supply on an Atom with internal regulators. Any of us with external power supplies (which are to be recommended to prevent the Atom eventually catching fire!) have a problem. I do not think it's possible to operate this circuit reliably from a 5 volt supply without the installation of an excessively large capacitor. The formula for working it out is roughly: Time (seconds) = C (microfarads) × R (megohms). You will need a delay of at least 50 milliseconds from switch-on for the power supply to be guaranteed stable and noise-free.

Figure 4 shows a little circuit I have breadboarded to solve most of these problems. Installation does, however, involve cutting a PCB track, so care should be taken to avoid conductor strain or bad connections to the PCB.

The CMOS 555 timer chip is wired as a monostable with its pulse timing derived from the RC pair at pins 6 and 7. It is triggered when the voltage on pin 2 rises above two-thirds of Vcc. The positive going output pulse is inverted by a NAND gate and passed to the rising edge (B) trigger of a 74121 TTL monostable. The relatively high resistor to ground from pin 2 is optional, and allows the threshold capacitor to discharge when the power supply is switched off again.

The Break key capacitor is removed, and its resistor changed to 4k7 ohms. The PCB track between the resistor/key junction and the input to the RESET line buffer IC9 is broken at a convenient point, and the key is connected to one of the falling edge (A) triggers of the 74121 via a NAND gate to invert the polarity.

Optionally, the spare input of the gate may be taken to a switched or latched logic level source, allowing low level to disable the Break key. The inverse output from the 74121 is connected to the PCB track into the RESET line buffers, and the power supply is taken from the 5 volt line as near as practicable to the power input socket from an external 5 volt supply.

The monostable which actually performs the reset is the 74121. This is a 'non-retriggerable' monostable, so it automatically kills any switch bounce during Break key operation, eliminating one of the prime causes of reset routine failure.

In this circuit the 555 delays the triggering of the reset pulse generator (74121) until the time set by the RC pair on pins 6/7 has expired. The delay is to allow the power supply to stabilise and become noise-free after switch-on. The 555 is also a non-retriggerable monostable, but here we are taking advantage of another two of its characteristics. The first is the triggering by referencing of the supply voltage to the comparator on pin 2. The second characteristic of importance is that the CMOS 555 will operate on supplies as low as 3 volts, with a consequent trigger point of about 2 volts. This allows it to operate here even under adverse power supply conditions. However, the decoupling capacitors across it are essential, as it can be susceptible to noise, leading to false triggering.

£5 A nice little dump

MIKE Wilding of Sale in Cheshire has sent in a nice little hex/ASCII dump which earns him a bit of the crinkly stuff. Written entirely in Basic, the routine is not exceptionally fast, but has a user-definable number of columns and start and finish addresses. The maximum number of columns is not limited by the software, but more than six will wrap around the screen line. The program waits for any key to be pressed at each line, which allows controlled dumping of specific areas, and continuous dumping is enabled by pressing RPT at the same time, eg, RPT SPACE.

As Mike points out, there are alternative ways of handling the dump control.

```
 10 @=0;P.$12;A=£80
 11 P."            mw hexdump"'
 12 P."             (C) M.A.
    WILDING 1984"''
 20 IN."START AT (HEX)"I
 30 IN."END AT (HEX)"J
 40 P.$12;IN."NO. OF
    COLUMNS"N
 50 IN."HARD COPY"$A;
    IF?A=CH"Y";P.$2;G.b
 60 P.$12
 70b P.&I
 80 F.P=I TO J
 90 X=(P-I);IFX=(P-I)/N*N;
    IFX>1;GOS.a
100 IF?P<£10;P." 0"&?P
110 IF?P>=£10;P." "&?P
120 N.
130 P.$3;E.
140a P." ";F.K=N TO 1 S.-1
150 C=P?(-K)
160 IFC>=£20;IFC<=£7A;P.$C
170 IFC<£20 OR C>£7A THEN
    P."."
180 N.;LINK£FFE3
190 P.'&P;R.
```

Mike Wilding's hex/ASCII dump

A useful variant he suggests is to assemble a four-instruction machine code routine at TOP to use the #FE71 keyscan routine. The sequence: SEC; JSR#FE71; BCC P-4; RTS; should be assembled at TOP, and LINK TOP installed in place of the LINK #FFE3 instruction at line 180, whereupon the dump will be continuous until a key is pressed, and will pause until the key is released again.

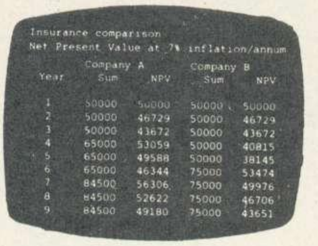
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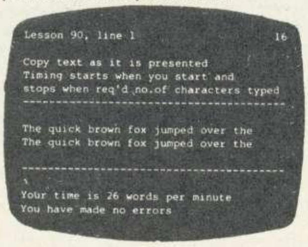


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Turning software into cash

COPYRIGHT, legal pitfalls and piracy are just three of the topics covered in *How to make Money from Your Software.*

The book is written by Anne Staines, a member of the British Computer Society's copyright committee. It costs £6.95 from ESC Publishing.

The low-down on companies

ANALYSES of the trading activities of Britain's computer companies are available from ICC Datacard Services at £8.25 each.

One sheet summaries give outlines of accounts, sales, profits and ratios of liquidity, gearing and employees. ICC is at 28 Banner St, London EC1 8QE.

Wordwise + tips

AU AUTHOR Paul Beverley's book *Using Wordwise Plus* published by Norwich Computer Services at £6.50 is available from T E R Roberts, Lamorna, The Street, Bunwell, Norfolk NR16 1NA. Add 50p for postage.

Double density discs for Z80

DOUBLE density disc interfaces are all the rage and Z80 second processor users are not left out. Slogger Software has released the Double Density CP/M (DDCPM) operating system for Z80 users.

The DDCPM is supplied on disc and requires the Opus Double Density Operating System board to be installed in the BBC micro.

The advantage of the double density system is that it allows almost twice as much data to be stored in the same disc space, 784k bytes in all, and is up to 25 per cent faster than the existing Acorn DFS.

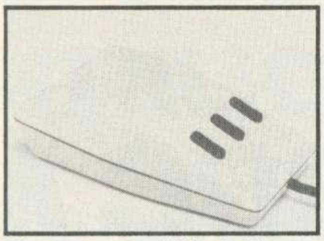
Mixed density discs on any drive are allowed and the software will automatically determine the density of the currently logged on disc. The DDCPM also allows up to 256 directory entries.

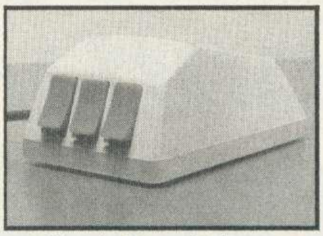
System Utilities are also supplied including FORMAT, SYSGEN, BACKUP, VERIFY and CONFIG. Use of the last will allow you to create your own working environment boot allowing selectable parallel/serial printer output with baud rate, printer ignore character, screen mode selection and screen foreground colour definition.

A comprehensive manual is supplied and compatibility with any Acorn single density CP/M disc as currently used on the Z80 is assured.

The cost of it all is £49.50, and a further £99.95 for the Opus DDOS if you don't already have it. For further information contact Slogger Software on (0634) 811634/41622 or Opus on (0737) 65080.

Look out for our special features on discs, disc drives and disc utilities in next month's *Acorn User.*





Megamouse and Magic Mouse: competitors in the rodent race

Mouse with graphics

COMPETITION to the AMX Mouse is hotting up with two new mechanical rodents for the BBC micro – and both undercut it in price.

The most obvious competitor to the £89.95 AMX Mouse is the Megamouse from Wigmore House which costs £88.55 and comes with its own graphics software called *Mousepaint* which works in mode 1.

Whereas AMX has its operating software on a chip which plugs into the BBC micro, Wigmore's software is all on disc. There is also a computer-aided design package, *Cadmouse*, for £27.60 which uses modes 1 or 2.

The other contender, Magic Mouse, comes from SMC and costs a mere £59.95, although its software is much less sophisticated.

Compatibility

Mice plug into the user port and by moving them around on a table top they can control a pointer on the screen to manipulate software. The AMX version is compatible with the 6502 and, through using CP/M Basic, the Z80 second processors.

Accounting for retail and wholesale

MICRO-TRADER, from Meadow Computers, is a low-cost accounting program for the BBC micro for the wholesale and retail trade.

All the normal accounting requirements are met by the software allowing you to set up fully integrated sales, purchase and nominal ledgers.

Each ledger has a comprehensive range of reports including account reports, lists of accounts, audit account, trial balance and creditors and debtors. Hard copies of each may be made to an Epson-compatible printer.

The nominal ledger has room for some 400 accounts and covers expenses, income, assets and liabilities. It can be fully updated by the other ledgers providing up to date trading reports. The Customs and Excise has approved the VAT program, says the distributor.

The sales and purchase ledgers hold up to 450 accounts and new accounts are simple to add. The sales ledger will also print customer invoices.

Future developments to enhance the *Micro-Trader* include stock control and mail merge programs to be released later this year.

The *Micro-Trader* is supplied on disc for £215. Contact Meadow Computers on (025682) 2008.

Guide to 'free' CP/M software

USERS OF Z80 second processors from Torch and Acorn will be interested in a book describing 70 public domain CP/M programs with an accompanying disc containing the software.

The book is American and is being distributed by a British publisher. It gives what the authors feel are the best of the free public domain programs available in the USA.

The range of software covers all users from the novice up, claims the publisher, with games, file management, business applications and even something for the 'hackers'.

The *Free Software Handbook* is priced at £17.95 (plus £1 post). To get the software costs an extra £10, with the buyer supplying 1200k-worth of formatted discs.

Contact Davis Rubin Associates, 1 Canonbourne, Weston-sub-Edge, Chipping Campden GL55 6QH.

TAILOR-MADE ALTERATIONS

Continuing his advice to ABC and Z80 users, Edward Brown shows you some changes you can make to CP/M

This month I'll take a closer look at CP/M and show you some alterations that can be made to CP/M on the Acorn machines.

When the machine is turned on control is passed to the ROM in the Z80 memory which copies code to the top of memory and boots CP/M from disc as described in the April issue. Control is then passed to CP/M and the CCP prompts for input. The memories of both the Z80 and the 6502 have now been initialised and the resulting memory map for the 6502 processor is shown in figure 1 and for the Z80 processor in figure 2.

The 6502 memory map

The memory map of the BBC micro with Z80 second processor is the same as that for the standard Beeb. Screen mode 0 is used, so memory from 3000H to 7FFFH is reserved for the screen image. Locations 2600H to 2FFFH are used as a directory buffer area to reduce the amount of disc access when accessing files. Locations 2500H to 25FFH are used to implement OSWORD call FFH to read and write blocks of I/O processor memory.

The Z80 memory map

The memory map of the Z80 processor is divided into six parts:

MOS – 6502 MOS routines
BIOS – Basic Input Output System
BDOS – Basic Disc Operating System
CCP – Console Command Processor
TPA – Transient Program Area
BP – Base Page (sometimes referred to as Zero Page)

MOS

On power on or reset the Z80 ROM is copied into locations F000H to FFFFH and it is these routines that provide the lowest level of interface to the peripheral hardware through the 6502 I/O processor. This area is mapped with the same jump table as the BBC MOS so the same effects can be generated by calling the same locations.

BIOS

In most CP/M systems the BIOS would give you the facilities that are provided by the MOS routines in the Acorn machines. CP/M considers the BIOS to be the lowest level of I/O which interacts directly with the hardware. In the Acorn implementation, however, the BIOS makes calls on the MOS routines to perform its task and presents the information back to CP/M as if it had carried out the task itself.

Routines for dealing with communications between hardware and software are via the jump table located at EA00H. A summary of the BIOS jumps is provided in table 1.

BDOS

The BDOS provides the commands for input and output to all the peripherals in a device-independent manner. It supports both sequential and random files, and provides facilities to support complex file operations. The BDOS calls the BIOS to perform the physical output operations necessary. A summary of the BDOS functions is given in table 2.

Addresses	Area
FFFFH – C000H	Machine Operating System MOS
BFFFH – 8000H	Paged ROMs
7FFFH – 3000H	Screen Area
2FFFH – 2600H	Directory buffer area
25FFH – 2500H	OSWORD FF code
1900H	Currently free
0000H	Reserved for MOS

Figure 1. Memory map for the BBC when a Z80 second processor is attached

Addresses	Area
FFFFH – F000H	MOS routines
EFFFH – EA00H	Basic Input Output System BIOS
E9FFH – DC00H	Basic Disc Operating System BDOS
DBFFH – D400H	Console Command Processor CCP
D3FFH – 0100H	Transient Program Area TPA
0000H	Base Page BP

Figure 2. Memory map of the Z80 processor

Command Console Processor

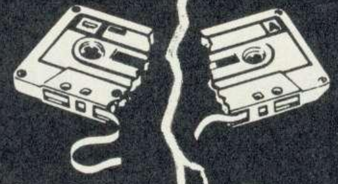
The CCP is the interface between the

Location	Content	Description
EA00H	JMP BOOT	Re-initialises the system
EA03H	JMP WBOOT	Re-loads the CCP and BDOS
EA06H	JMP CONST	Checks console status*
EA09H	JMP CONIN	Input a character from CON:
EA0CH	JMP CONOUT	Output a character CON:
EA0FH	JMP LIST	Output a character to LST:
EA12H	JMP PUNCH	Output a character to PUN:
EA15H	JMP READER	Input a character from RDR:
EA18H	JMP HOME	Select track 0 of current drive
EA1BH	JMP SELDSK	Select drive
EA1EH	JMP SETTRK	Select track
EA21H	JMP SETSEC	Select sector
EA24H	JMP SETDMA	Select disc buffer area
EA27H	JMP READ	Read sector from disc
EA2AH	JMP WRITE	Write sector to disc
EA2DH	JMP LISTST	Check LST: status
EA30H	JMP SECTRAN	Translate logical to physical sector

**A true console status is returned every 12 calls if no other I/O is being performed. This is to avoid undue waste of time as the Acorn machines take longer than others to check the console.*

Table 1. Summary of the BIOS jumps

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AU 6/2

user and CP/M. It resides in the TPA (Transit Program Area) and is a special case of transient program in that it is not loaded at 100H. The CCP takes input from the console and changes all characters to upper case before trying to decide whether it is a built-in command or a transient command. The commands available in the CCP were dealt with in the April issue.

Transient program area

This is the area of memory for running application programs – it starts at 100H and runs through to DC00H.

Address	Contents
0100H	Start of the Transient Program Area
00FFH – 0080H	Default disc buffer area and command line area
007FH – 005CH	Default file control block area
005BH – 003BH	Not used
003AH – 0038H	Restart vector for Z80 faults on Acorn machines
0037H – 0035H	Restart vector for DDT, ZSID on Acorn machines
0034H – 0008H	Not used
0007H – 0005H	Jump to BDOS
0004H	Current drive and user area, four bits for each
0003H – 0002H	IOBYTE for logical to physical device mapping
0000H	Jump to warm boot entry in BIOS

Figure 3. Details of the Base Page

Base page (BP)

This is the area reserved for use by CP/M – you'll find full details in figure 3.

```
A>
A>MOVCPM * * ——————————— (1)

CONSTRUCTING 64k CP/M vers 2.2 ┐
READY FOR "SYSGEN" OR          ├ (2)
"SAVE 39 CPM64.COM"            ┘
A>
A>SAVE 39 CPM64.COM ————— (3)
A>DDT CPM64.COM ——————— (4)
DDT VERS 2.2
NEXT  PC
2800 0100
-DC90,CA0 ————————————— (5)
0C90 44 49 52 20 45 52 41 20 54 59
  50 45 53 41 56 45 DIR ERA TYPESAVE
0CA0 52 R
-SC90 ————————————————— (6)
0C90 44 43 ┐
0C91 49 41 │
0C92 52 54 ├ (7)
0C93 20 .  ┘
-G0 ——————————————————— (8)

A>SAVE 39 CPM64.COM —— (9)
A>SYSGEN                                                 ┐
SYSGEN VERSION 1.60                                      │
SOURCE DRIVE NAME (OR RETURN TO SKIP)                    │
DESTINATION DRIVE NAME (OR RETURN TO REBOOT) A           ├ (10)
DESTINATION ON A, THEN TYPE RETURN                       │
FUNCTION COMPLETE                                        │
DESTINATION DRIVE NAME (OR RETURN TO REBOOT)             ┘
A>DIR
DIR?——————————————————— (11)

A>CAT—————————————————— (12)
A: SYSGEN   COM : MOVCPM   COM : DDT      COM : CPM64    COM
A>
```

1 create a memory image of CP/M
2 MOVCPM tells you what it has done
3 save the memory image
4 load the image with DDT
5 display the start of the command table
6 select the locations to change
7 change DIR to CAT
8 return to prompt
9 save the modified image
10 perform a system generation the image is in memory and is to go on disc A
11 DIR no longer works
12 but CAT does

Figure 4. Patch to alter the CCP command table

```
A>
A>DDT CPM64.COM ┐
DDT VERS 2.2    ├ (1)
NEXT  PC        │
2800 0100       ┘
-LAB0           ┐
  0AB0  CPI  61 │
  0AB2  RC      │
  0AB3  CPI  7B │
  0AB5  RNC     │
  0AB6  ANI  5F ├ (2)
  0AB8  RET     │
  0AB9  LDA  DBAB
  0ABC  ORA  A  │
  0ABD  JZ   D596
  0AC0  LDA  DBEF
  0AC3  ORA  A  ┘
-AAB0
0AB0  RET ————————— (3)
0AB1  .
-G0 ——————————————— (4)

A>SAVE 39 CPM64.COM — (5)
A>SYSGEN                                          ┐
SYSGEN VERSION 1.60                               │
SOURCE DRIVE NAME (OR RETURN TO SKIP)             │
DESTINATION DRIVE NAME (OR RETURN TO REBOOT) A    ├ (6)
DESTINATION ON A, THEN TYPE RETURN                │
FUNCTION COMPLETE                                 │
DESTINATION DRIVE NAME (OR RETURN TO REBOOT)      ┘
A>CAT
A: SYSGEN   COM : MOVCPM   COM : DDT      COM : CPM64    COM ├ (7)
A>cat  ┐
cat?   │
       ├ (8)
A>ddt  │
ddt?   ┘
```

1 load the image with DDT
2 list the section of code that does the character folding
3 alter the first instruction to a return
4 return to the command level
5 save the image
6 generate the system
7 CAT still works
8 CAT and DDT no longer work

Figure 5. Patch to stop character folding

```
A>
A>DDT CPM64.COM ┐
DDT VERS 2.2    ├ (1)
NEXT  PC        │
2800 0100       ┘
-D1F80                                                                    ┐
1F80 C3 F7 EC C3 D3 EC C3 A2 EA C3 AE EA C3 BA EA C3 ................     │
1F90 C6 EA C3 DE EA C3 EA EA C3 7E ED C3 92 ED C3 8A .........~......     │
1FA0 ED C3 A6 ED C3 79 ED C3 AB ED C3 C6 ED C3 D2 EA .....y..........     │
1FB0 C3 8F ED C9 47 72 65 65 74 69 6E 67 73 20 66 72 ....Greetings fr     │
1FC0 6F 6D 20 43 6C 65 61 6E 20 45 6E 64 20 2D 20 49 om Clean End - I     │
1FD0 61 6E 20 4D 61 72 6B 20 4E 65 69 6C 20 53 69 6D an Mark Neil Sim     ├ (2)
1FE0 6F 6E 20 44 69 72 74 79 20 45 6E 64 20 2D 20 44 on Dirty End - D     │
1FF0 61 76 65 20 49 61 6E 20 4A 6F 68 6E 20 54 6F 62 ave Ian John Tob     │
2000 79 42 6F 73 73 20 4D 61 6E 20 2D 20 48 6F 77 61 yBoss Man - Howa     │
2010 72 64 20 3E 83 32 03 00 2E 02 3E 02 CD F4 FF C3 rd >.2....>.....     │
2020 BD EB CD 02 EB 81 8A EB 50 EB F6 EA 24 EB CD 02 ........P...$...     │
2030 EB 01 98 EB 54 EB EA EA E0 FF CD 02 EB 01 9C EB ....T...........     ┘
-A1FB3          ┐
1FB3  MVI A,5   │
1FB5  MVI L,2   ├ (3)
1FB7  CALL FFF4 │
1FBA  RET       │
1FBB  .         ┘
-G0 ————————————— (4)

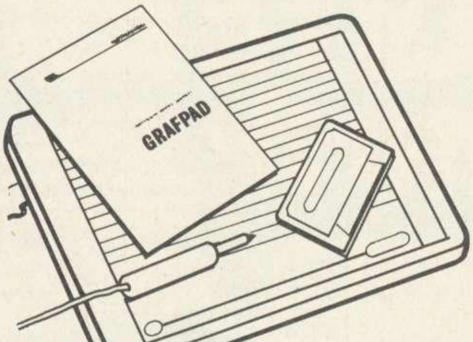
A>SAVE 39 CPM64.COM ———— (5)
A>SYSGEN                                          ┐
SYSGEN VERSION 1.60                               │
SOURCE DRIVE NAME (OR RETURN TO SKIP)             │
DESTINATION DRIVE NAME (OR RETURN TO REBOOT) A    ├ (6)
DESTINATION ON A, THEN TYPE RETURN                │
FUNCTION COMPLETE                                 │
DESTINATION DRIVE NAME (OR RETURN TO REBOOT)      ┘
———————————— (7)
```

1 load the image with DDT
2 display the patch area
3 assemble in the new code
4 return to the command level
5 save the image
6 generate the system
7 it was not possible to get any further output as the printer had been redirected

Figure 6. Patch to redirect the printer to the serial channel

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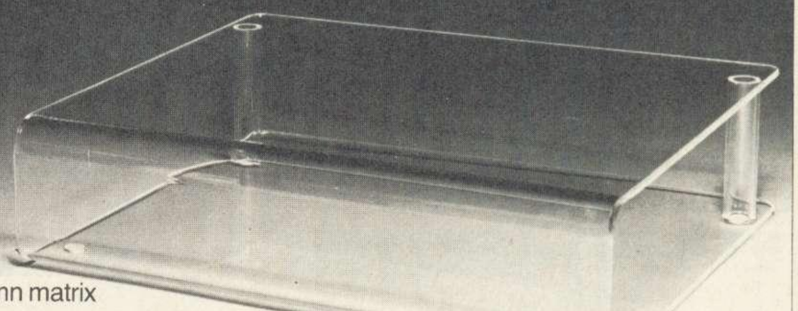
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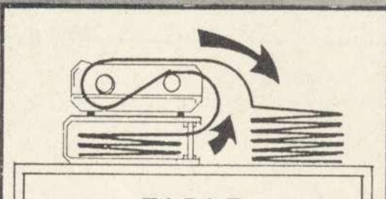
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Patching CP/M-80

Patching a program is the process of altering machine code to perform differently. In 1982 Digital Research, the producer of CP/M-80, issued a series of application notes detailing patches that can be made to CP/M-80. Most of these patches have been incorporated in the Acorn version of CP/M-80 and its utilities.

One of these application notes was to allow an auto boot facility at power on or reset. Acorn implemented its own version of this which takes up nearly 200 bytes in the BIOS. The patch in figure 7 shows how to modify the Acorn BIOS to bring it into line with the Digital Research application note.

Altering the CCP command table

The command MOVCPM * * creates a memory image of CP/M in preparation for the SYSGEN command to copy this onto the system tracks of the disc (figure 4). This memory image can be saved and then altered using DDT before using SYSGEN to place it on the disc. By applying this patch you alter the command table used by the CCP to determine if what was typed is a built-in command or a transient command.

Once this patch is in place DIR will no longer be a built-in command. It can be replaced by reversing the process. It is not advisable to alter the CCP command table under normal circumstances, but it can be useful. I have used this technique to remove the ERA command from the CCP which effectively stops you from deleting files. A useful approach is to remove the ERA command from the CCP and include on disc a program that performs an erase with query (eg, ERQ from the CP/M UG UK library) but name it ERA. This means that every time you type ERA it will run the transient erase utility instead.

Removing character folding

As explained earlier, the CCP converts all lower case characters to upper case before looking for them in the CCP command table (figure 5). By applying this patch character folding, as it is called,


```
-
A>DDT CPM64.COM            (1)
DDT VERS 2.2
NEXT  PC
2800 0100
-L2270                     (2)
  2270  MOV  A,C
  2271  ANI  F0
  2273  MOV  C,A
  2274  JMP  D400
  2277  LXI  SP,F4E0
  227A  CALL ED32
  227D  STA  ED43
  2280  XRA  A
  2281  STA  0004
  2284  CALL ED44
  2287  CALL EA33
-A2274                     (3)
2274  JMP D403
2277  .
-L2270                     (4)
  2270  MOV  A,C
  2271  ANI  F0
  2273  MOV  C,A
  2274  JMP  D403
  2277  LXI  SP,F4E0
  227A  CALL ED32
  227D  STA  ED43
  2280  XRA  A
  2281  STA  0004
  2284  CALL ED44
  2287  CALL EA33
-
-L22AD                     (5)
  22AD  CALL F08E
  22B0  ??=  18
  22B1  ORA  H
  22B2  XRA  A
  22B3  LXI  H,DC06
  22B6  ADD  M
  22B7  INX  H
  22B8  XCHG
  22B9  STC
  22BA  LXI  H,E9FF
  22BD  ??=  ED
-A22AD                     (6)
22AD  MVI C,0
22AF  JMP D400
22B2  .
-
-D980                      (7)
0980 C3 5C D7 C3 58 D7 7F 00 20 20 20 20 20 20 20 20 .\..X...
0990 20 20 20 20 20 20 20 20 43 4F 50 59 52 49 47 48         COPYRIGH
09A0 54 20 28 43 29 20 31 39 37 39 2C 20 44 49 47 49 T (C) 1979, DIGI
09B0 54 41 4C 20 52 45 53 45 41 52 43 48 20 20 00 00 TAL RESEARCH  ..
09C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
09D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
09E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
09F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
0A00 00 00 00 00 00 00 00 00 08 D4 00 00 5F 0E 02 C3 ............_...
0A10 05 00 C5 CD 8C D4 C1 C9 3E 0D CD 92 D4 3E 0A C3 ........>....>..
0A20 92 D4 3E 20 C3 92 D4 C5 CD 98 D4 E1 7E B7 C8 23 ..> ........~..£
0A30 E5 CD 8C D4 E1 C3 AC D4 0E 0D C3 05 00 5F 0E 0E ............._..
-S987                      (8)
0987 00 03
0988 20 43
0989 20 41
098A 20 54
098B 20 00
098C 20 .
-G0                        (9)

A>SAVE 39 CPM64.COM        (10)
A>SYSGEN
SYSGEN VERSION 1.60        (11)
SOURCE DRIVE NAME (OR RETURN TO SKIP)
DESTINATION DRIVE NAME (OR RETURN TO REBOOT) A
DESTINATION ON A, THEN TYPE RETURN
FUNCTION COMPLETE
DESTINATION DRIVE NAME (OR RETURN TO REBOOT)
```

1 load the image with DDT
2 list the piece of code to be modified
3 assemble in a jump to the second entry of the CCP (ie, CCP+3): this is the warm boot jump
4 redisplay the altered code
5 list the start of the Acorn auto boot code, the ??= is a Z80 mnemonic that DDT does not understand
6 assemble in a jump to CCP, C=0 to indicate drive A, 1 for drive B
7 display the start of the CCP
8 select the memory to be altered and make it a three byte string. CAT terminated by 00
9 return to the command level
10 save the memory image
11 generate a new system

now on hard reset the system will automatically display the directory, any other command can be given instead of CAT

Figure 7. Patch to implement an autoboot facility

The IOBYTE

CP/M communicates to the outside world through four logical devices. These logical devices are CON: (console), LST: (list), RDR: (reader), PUN: (punch). The last two refer to paper tape input and output devices and are named for historic reasons. Each of these devices can be assigned one of four possible physical devices and the IOBYTE is set according to these assignments. To assign a physical device to a logical device the IOBYTE can be altered directly or the STAT utility can be used (eg, STAT CON:=UC1 the default setting). Each logical device is allocated two bits to represent the physical device assigned to it. The physical devices for each logical device and the layout of the IOBYTE are as follows:

Devices

CON: = TTY: 0 RS423 serial line
CRT: 1 Screen and keyboard (MOS redirection disabled)
BAT: 2 Input from RDR: and output to LST:
UC1: 3 Screen and keyboard (MOS redirection enabled)

RDR: = TTY: 0 RS423 serial line
PTR: 1 Keyboard
UR1: 2 Not used
UR2: 3 Not used

PUN: = TTY: 0 RS423 serial line
PTP: 1 Screen
UP1: 2 Not used
UP2: 3 Not used

LST: = TTY: 0 RS423 serial line
CRT: 1 Screen and keyboard (MOS redirection disabled)
LPT: 2 Printer
UL1: 3 Not used

Layout

	LST:	PUN:	RDR:	CON:	
IOBYTE bits	7 6	5 4	3 2	1 0	
default setting	1 0	0 0	0 0	1 1	=83H
values	2	0	0	3	

will not take place. However, if you transfer files to a disc that does not have a CCP patched in the same way, you will see but not be able to access lower case named files.

Adding initialisation code

Acorn have provided a patch area in the BIOS so that the user can add his own initialisation code. This is useful to avoid the necessity of keying in initialisation commands each time you want to use a particular disc, and I have patched the disc I use for communications to initialise the baud rate of the serial channels to the appropriate speed. The patch shown (figure 6) will redirect the printer to the serial channel using the OSBYTE routine. Location 1FB3H is called before setting the IOBYTE (see box) every time the machine is powered on or a hard break occurs. The area from 1FB3H to 2012H is available for you to provide your own initialisation code.

CP/M CORNER

Tips by Edward Brown and Richard Clement

THE Z80 second processor provides an additional OSWORD call (255,0FFH) to read and write blocks of I/O processor memory. On entry the HL register pair should point to a control block specified:

HL+0	Set to 13 decimal 0DH
HL+1	Set to 1
HL+2/3	LSW of I/O processor memory
HL+4/5	MSW of I/O processor memory. 0 for BBC
HL+6/7	LSW of host processor memory
HL+8/9	MSW of host processor memory. 0 for Z80
HL+10(0AH)	LSB of number of bytes to read/write
HL+11(0BH)	MSB of number of bytes to read/write
HL+12(0CH)	Operation type. 0 to write to BBC, 1 to read from BBC

An example program for reading the screen memory from the BBC into the Z80 is shown in the listing below.

The Z80 second processor reserves certain areas of memory in the BBC and should not be used. These are 2500H to 25FFH which is reserved for use by Z80 – this is where the block

```
   10REM BLOCK MOVE TO AND FROM B
BC WITH Z80 SECOND PROCESSOR
   20REM EDWARD BROWN
   30REM For BBC B with Z80 secon
d processor
   40REM (c) E. J. Brown
   50:
   60REM Build the parameter bloc
k to read write screen in mode 0
   70:
   80DIM parameter_block 13
   90?parameter_block=&0D
  100parameter_block?1=1
  110parameter_block!2=&00003000
  120parameter_block!6=&00008000
  130parameter_block?10=&00
  140parameter_block?11=&50
  150parameter_block?12=1
  160:
  170REM parameters for OSWORD, A
%=A, Y%=H, X%=L
  180:
  190A%=255
  200X%=parameter_block MOD 256
  210Y%=parameter_block DIV 256
  220:
  230REM read the screen from BBC
 memory
  240:
  250CALL &FFF1
  260CLS
  270PRINT "Press any key"
  280key_pressed$=INKEY$(1000)
  290CLS
  300:
  310REM restore the screen now
  320:
  330parameter_block?12=0
  340CALL &FFF1
  350END
```

move code is located, and 2600H to 2FFFH which is saved for use by CP/M.

If you wish to use this call to load a program for use with the *CODE or *LINE facility then remember:

1 Change the user vector to point to your own routine, and save the previous contents as they point to the block move code.

2 Check the A register for the correct entry parameter, 0 for *CODE, 1 for *LINE. If not correct then pass control to the block move code.

Function	Description
0	System reset, perform a warm boot
1	Read a character from CON:, editing enabled
2	Write a character to CON:, pause enabled
3	Read a character from RDR:
4	Write a character to PUN:
5	Write a character to LST:
6	Read/Write a character to CON:, editing disabled
7	Get the logical to physical device mapping
8	Set the logical to physical device mapping
9	Write a string to CON:
10	Read a string from CON:, editing enabled
11	Get CON: status
12	Return version number
13	Reset all drives to Read/Write status
14	Select a drive
15	Open file
16	Close file
17	Search for first occurance of file in directory
18	Search for next occurance of file in directory
19	Delete file from directory
20	Read a sector from file sequentially
21	Write a sector to the file sequentially
22	Make (create) a file on disc
23	Rename file on disc
24	Return indication of drives logged in
25	Return indication of current drive
26	Set the buffer address for file transfer
27	Return the allocation vector for disc information
28	Write protect disc
29	Return indication of which drives are read only
30	Set the attributes of a file
31	Return the address of the disc parameter block
32	Get/set user area
33	Read specified sector from file (read random)
34	Write a specified sector to file (write random)
35	Compute file size
36	Set random record field for file
37	Reset specified drives
38	Not implemented
39	Not implemented
40	Write specified sector and fill with zeros

Table 2. Summary of the BDOS functions

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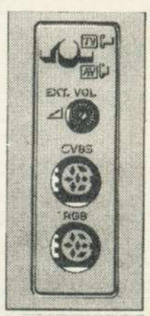
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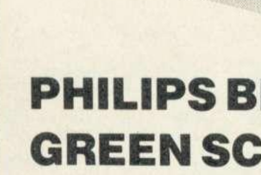
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EASY DRIVER

This printer driver generator for the *View* wordprocessor by George Hill offers many original features

THE train of thought leading to this article and program was sparked off by Tony Rudkin's piece in the March 1984 issue (page 102). The result is this printer driver generator for *View*. To use it you need only to be able to read the summary pages of your printer manual, and sort out the codes which set and cancel any function. The program is suitable for the BBC B and Electron with Plus 1, with Basic 1 or 2.

The new approach lies in the ability of this driver to act in two ways. It will behave as a perfectly normal printer driver on initialisation, with 13 different highlights available. It can also allow the easy use of many control codes at once, instead of *View*'s normal two. This is accomplished by using the edit command function to change highlight 2 to 141 – ie, the command:

HT 2 141

will appear in the margin. After this, highlight 2 will be regarded as a prefix character, and the *next* character will be used to determine the highlight code emitted. Prior to this, all highlight commands are treated normally.

This means you can have up to 13 different highlight codes defined at once, and use them all, singly or in combination without another HT command. Figure 1 illustrates the method. It shows the source text and its printed output using an Epson FX80. Figure 2 shows the functions, control codes and capabilities of the driver used. (It's the printout from PROCshow_driver and PROCprint_driver, when the driver was generated.)

The driver in its 'default mode' retains the useful 'pad character' feature of the Rudkin driver. The pound sign key generates ASCII 96, generally printed as a 'tic' ('). This is replaced in the output to the printer by a space (ASCII 32), which enables you to insert this character in the text to prevent two words being printed on separate lines.

A procedure (PROCpound_sign) allows you to alter this feature, so that the true pound sign is generated by the £ key. Find the ASCII value of the £ character on your printer, and type it in in response to the prompt.

A *View* printer driver is a piece of machine code which sits in page 4 (&400 to &4FF). Its function is to sort out, and then cause to be printed, characters sent to it by the *View* 'PRINT' command. This one has been assembled at address &5000, and then all bytes which are equal to &50 are translated to &04 before saving, in PROCadjust_code. Electron users will lack the coloured effects available in mode 7 on the BBC micro, and should change line 70 to mode 6.

```
HT 128 ESC - ^1 ESC - ^0 U/L
HT 129 ESC E | ESC F | EMPH
HT 130 ESC G | ESC H | D/S
HT 131 ESC W ^1 ESC W ^0 WIDE
HT 132 ^15 | | ^18 | | COND
HT 133 ESC S ^0 ESC T | SUP
HT 134 ESC S ^1 ESC T |. SUB
HT 135 ESC M | ESC P | ELIT
HT 136 ESC p ^1 ESC p ^0 PROP
HT 137 ESC 4 | ESC 5 | ITAL
HT 138 ESC R ^0 ESC R ^3 USUK
HT 139 ESC R ^3 ESC R ^0 UKUS
HT 140 | | | | | |
HT 141 | | | | | |
HT 142 ESC @ | ^0 INIT
```

Figure 1. Output from PROCshow_driver

The basic program

The program allows two modes of use: create driver mode – using PROCnew – and edit driver mode – using PROCedit. Edit mode will only allow the modification of a driver created by this program, not of any other driver!

PROCnew calls five procedures:
PROCassemble assembles the main routine.
PROCmake_table sets up the table of highlights interactively.
PROCshow_driver shows the codes you have entered on the screen, including comments (which are not obligatory, but strongly advised). A printer option is included, but can only be used if your printer ignores characters > ASCII 128.
PROCprint_driver gives a listing of the comments on the printer, together with the highlight codes, and the letters which can be used to obtain the effect, in conjunction with HT 141.
PROCsave_driver saves the routine under a name which you supply.

PROCedit calls five procedures:
PROCload_driver call up a previously defined driver from disc.
PROCpound_sign, PROCshow_driver, PROCprint_driver, and **PROCsave_driver** are the procedures also used in PROCnew.

The assembly language procedure (PROCassemble)

The basic jump codes at the start of the driver are as described by Tony Rudkin.

I have not initialised the printer in the 'on' routine (line 380) but left highlight code 142 available to fulfil that function. It presently sends ESC @ which initialises an Epson. You can alter that code in PROCinit_code if you need to. Note that the 'reset function' for initialisation merely sends a NUL (ie, a 0) to the printer, and resets a flag. 'On' and 'off' perform VDU2 and VDU3 respectively.

The 'print' routine (line 440) first stores the register contents, and then tests 'flag'. This is clear (= 0) initially. It is set (= 255) on receipt of code 141, the multi-purpose highlight code.

If flag is set, then it is reset (inc flag), and the character in 'acc' is sent to the highlight routine. If flag is clear, the character in 'acc' is tested.

- If the register content is 141, then 'flag' is set (dec flag) and the routine is terminated (jmp restore).
- If the register content is negative (ie, > 128) then it is a normal highlight and is passed to the highlight routine.
- If the register content is 96 (the pound sign) it is replaced by a space, or your printer's pound sign character.
- Otherwise the register content is printed (via OSASCI to obtain proper linefeeds), the registers are restored and the routine returned from.

```
ASCII...CHARACTERS....COMMENT
 128     @ P £ p 0     U/L
 129     A Q a q 1     EMPH
 130     B R b r 2     D/S
 131     C S c s 3     WIDE
 132     D T d t 4     COND
 133     E U e u 5     SUP
 134     F V f v 6     SUB
 135     G W g w 7     ELIT
 136     H X h x 8     PROP
 137     I Y i y 9     ITAL
 138     J Z j z :     USUK
 139     K [ k { ;     UKUS
 140     L \ l | <
 141     M ] m } =
 142     N ^ n ~ >
```

Figure 2. Output from PROCprint_driver

The highlight routine is entered under two conditions. If 'flag' was set by a preceding 141 character, the charac-

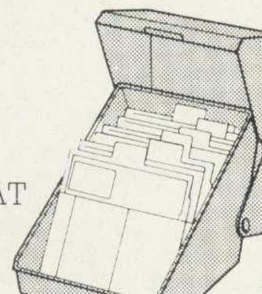
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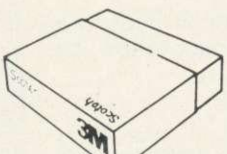
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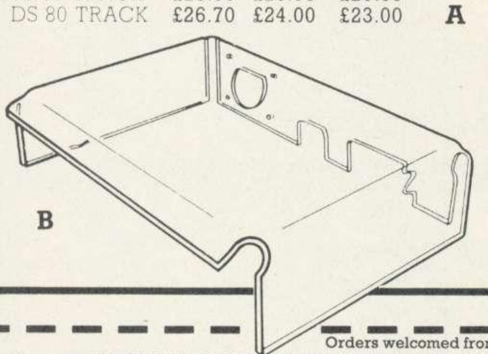
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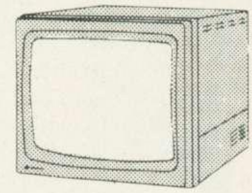


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ter following the 141 is treated as the 'highlight index'. If the character was > 128 (but not 141), it acts as the index itself.

In both cases the bottom four bits only (giving a number between 0 and 15) are used as an index for retrieval from the table of highlights. The X register is set to eight times the index, as each highlight code set occupies eight bytes (see below).

The table of highlights

The highlight table is constructed so that each highlight has eight bytes allocated to it, arranged so that up to three bytes can be sent to the printer for setting, and up to three for resetting. The offsets are:

byte0	1,2,3	4	5,6,7
number	setting codes	number	cancelling codes

The numbers at byte 0 and byte 4 are the number of bytes to send from the following three. All unused bytes are initialised to 255, and if a 255 is encountered in byte 0 it is treated as a 'null highlight' and the routine is terminated.

In addition, the left-most bit of byte 0 is a flag to tell the routine whether to set or reset the function. It is reversed each time the highlight is called up.

Note that codes *must always* be in pairs. Virtually all printer functions have a cancelling counterpart. If you cannot find a counterpart, then either enter the same code twice, so that it will always be set whenever the code is sent, or place a NUL (0) in the reset position as I have done in the initialisation routine.

The routine determines whether to set or reset, then uses either byte 0 or 4 as an index for a loop which sends the next characters to the printer only. When complete, the routine exits, first restoring the registers (jmp restore).

Using the generator

To generate a driver, first do a little planning. Take your printer manual and write down the setting and cancelling codes for the features you want. This would take the form:

Underline	ESC – 1 / ESC – 0	
Emphasised	ESC E / ESC F	
American	ESC R 0 / ESC R 1	British
Condensed	15 / 18	
etc		

To enter these in the program, first supply the number of bytes (eg, 3 for Underline, 2 for Emphasised and 1 for Condensed in the above example). The codes can now be entered. Normal ASCII characters are generated by normal keys and the Escape key generates character 27. (This is the reason for the *FX229,1 in PROCcontrol_codes – it disables normal escape action.) To generate numbers between 0 and 31 or 'control characters' use the CTRL key

Key	Normal ASCII code	Code with <CTRL> key	ASCII mnemonic
@	64	0	NUL
A	65	1	SOH
B	66	2	STX
C	67	3	ETX
D	68	4	EOT
E	69	5	ENQ
F	70	6	ACK
G	71	7	BEL
H	72	8	BS
I	73	9	HT
J	74	10	LF
K	75	11	VT
L	76	12	FF
M	77	13	CR
N	78	14	SO
O	79	15	SI
P	80	16	DLE
Q	81	17	DC1
R	82	18	DC2
S	83	19	DC3
T	84	20	DC4
U	85	21	NAK
V	86	22	SYN
W	87	23	ETB
X	88	24	CAN
Y	89	25	EM
Z	90	26	SUB
[	91	27	ESC
\	92	28	FS
]	93	29	GS
∧	94	30	RS

Figure 3. Generating ASCII control codes

in conjunction with an alphabetic key, as indicated in figure 3. The screen has the ∧ sign preceding control characters. To generate other numbers, use the key that gives the appropriate ASCII value.

Run the program and reply to the prompts. The input routine allows a primitive editing facility, in that you can step forwards (+) or backwards (–). Type 'END' to complete the definition. The fully defined driver will be shown on the screen, and can be output to the printer. Undefined bytes are shown as !. You can re-edit mistakes at this stage and also edit code 142 (the initialisation code). Note that there is only room for 1 byte for the cancelling code for HT 142, and any attempt to define more is doomed! PROCprint_driver produces a listing to remind you of the defined functions when using *View* and your driver. The final prompt asks you to supply a name <yourname> for your driver to be filed under. No checking takes place, and an invalid filename, or the name of a file which already exists and is locked will result in an error. (You can try again by typing PROCsave_file if this happens.)

The wide variety of letters and numbers which can be used to set printer functions makes it possible to employ reasonably mnemonic codes such as I for italic, U for underline, etc.

To edit a driver you are asked to supply a filename, and the program will load the driver into a buffer, check your pound sign requirements, show it and allow you to edit it. (Respond N to the initial question!)

Using the driver

To use the driver after saving, enter *View* and type

PRINTER <yourname>

If you have set up highlight codes which are the same as the 'default' driver, or an Acornsoft-supplied driver, then text prepared for these drivers will still work on the new one. In addition you will be able to use:

HT 2 141

followed by *@,*A,*B,*C etc. OR
*£,*a,*b,*c etc. OR
*0,*1,*2,*3 etc. OR
*P,*Q,*R,*S etc.

to generate single or mixed highlights. (Note that * represents the effect of <SHIFT f5>.)

There is not normally a problem if you make a mistake in the character following 141, but there will be odd and possibly catastrophic results if it is 0,o,/,? or _, as there is not quite room for a fifteenth code, and number 15 points into page 5, which is unknown territory!

Printer initialisation is carried out by:

HT 2141(margin command)
*N*N

at the start of the text. (*represents HT 2 generated by <SHIFTf5>.) This sends the initialising bytes, followed by a NUL, and resets the initialising flag so that it can be reused at the start of the next printout.

The View printer driver listing is on yellow pages 108–110

Megamouse's full-colour challenge

MEGAMOUSE is a rival to the marvellous AMX Mouse and has the usual mousy characteristics but will draw in full colour too.

It utilises mode 0 or mode 1, depending on colour/resolution constraints, and sports a variety of features not found on its predecessor. It has a greater flexibility of use and is intended as a serious design tool but has obvious spin-offs for education.

However, as is always the case with this sort of thing, there are features missing from the Megamouse that exist in the AMX.

The Megamouse is produced by Wigmore House, the company that produced the Trackball and its associated graphics packages. The beauty of its graphics package is that it is designed to be used with any analogue unit so that joysticks, trackball or mouse may be linked to the package.

The price is a little higher than the AMX Mouse but they may possibly be persuaded to give an educational discount if you buy in quantity.

Details from Wigmore House, 32 Savile Row, London W1X 1AG. Tel: 01-734 0171.

Edword upgrade more compatible

WORDPROCESSING fanatics will be pleased to hear of *Edword 2*, an upgrade to *Edword*. As well as the usual *Edword* facilities it includes the provision of an accented character set for foreign language work, fast cursor movement, memory-free information, automatic selection of lower case, and enhanced handling of memory-full condition.

It is now compatible with DNFS and with the second processor. The Break key problem has finally been solved, the £ sign printing can now be controlled and the software will search out print files within a library.

More details from Clwyd Technics, Unit 4B, Antelope Industrial Estate, Rhydymwyn, Mold, Clwyd CH7 5JH. Tel: (035283) 751.

Commentary by Nick Evans, who welcomes reader feedback



What's the future of the BBC micro in our schools?

THE MAGIC buzz-word at the moment is 16 bit and, with the arrival of the RML Nimbus, many users are wondering just how long the old 8 bits are going to continue to be supported by the industry.

It seems not so long ago that the BBC micro was the best thing since sliced bread. Now, a year or so further on, its 32k is starting to look a little slim and the necessity for a second processor becomes ever more pressing.

Software wizards have managed to cram unimaginable quantities into the existing space and, with the use of frequent disc access there has been a great extension in the scope of educational programs available. But what will we be wanting one or two years hence?

Applications

This is probably a good moment to step back and consider why we have the micro in the classroom at all. In a computer studies context we have it to learn about the computer itself, its development and its applications.

However, a change of emphasis is definitely to be seen, especially in the examination boards' proposed syllabuses for the next few years. Knowledge of the computer does still count, but is seen as of less importance than knowledge of applications, for example, how the machine may best be used to solve problems in areas such as graphics and design, communications, craft, control, information systems and a whole host of related topics right across the curriculum.

Real-life

The use of the computer and its relation to real-life skills is the keynote for the next couple of years. How are businesses, industry and the world in general using the new technology? How is information important and how do we generate it, store it, access it and handle it? How do advanced technologies such as robotics, artificial intelligence and expert systems fit into our view of the world as seen from the classroom?

The problems that teachers face are all to do with making the material taught in the classroom relevant to what is going on outside. There has always been a time-gap between innovation and classroom teaching and, with the microcomputer revolution, this gap was minimised by the DOI initiative in getting machines into schools.

How many schools, having spent thousands of pounds on new equipment are going to want to scrap it, trade it in or supplement it with the proposed 16 and 32 bit machines? How many people have mastered the technology they already have available and are able to use it to its best advantage? Questions like these make one pause for

Continued on page 143 ▶

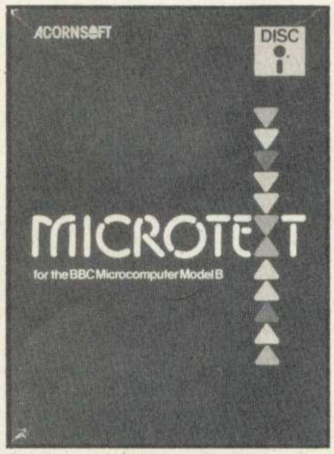
New scale of Microtext fees from Acornsoft

ACORNSOFT has updated the system of licence fees for the Microtext authoring package (see Microtext – 'crippled at birth' by licences, page 151, April).

For Licence Type A (which covers in-house publishing) the rate is based on the number of computers available: 1–20, £40; 21–50, £75; over 50, £120.

Licence Type B covers free distribution out of house and costs either £30 plus 50p per copy distributed; or £200 plus 10p per copy; or £1000 outright.

If you are producing software for sale you'll need licence Type C, for commercial publishing. This costs £6000 plus 50p per copy; or £4000 plus £1 per copy; or £2000 plus £3 per copy; or £250 plus £5 per copy.



Microtext: not cheap

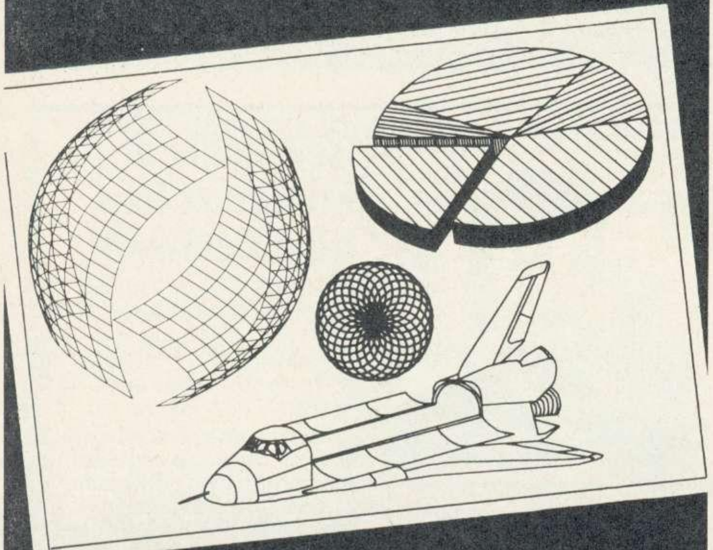
Micro insurance from MUSE

AN INSURANCE scheme for micros in schools has been set up by MUSE (Microcomputer Users in Education).

It covers accidental damage, fire, malicious damage and theft, but differs from other policies in covering the micros in the school, in the home of a member of staff or senior pupil, or in transit in a car. It is also available for individuals.

The present annual premium is 1.68 per cent of the value insured.

The scheme is open to non-members of MUSE. MUSE can be contacted at PO Box 43, Hull HU1 2HD. Tel: (0482) 20268.



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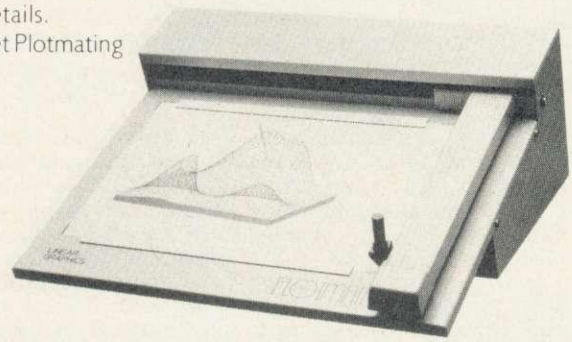
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Concept Keyboard news-sheet out – plus special offers

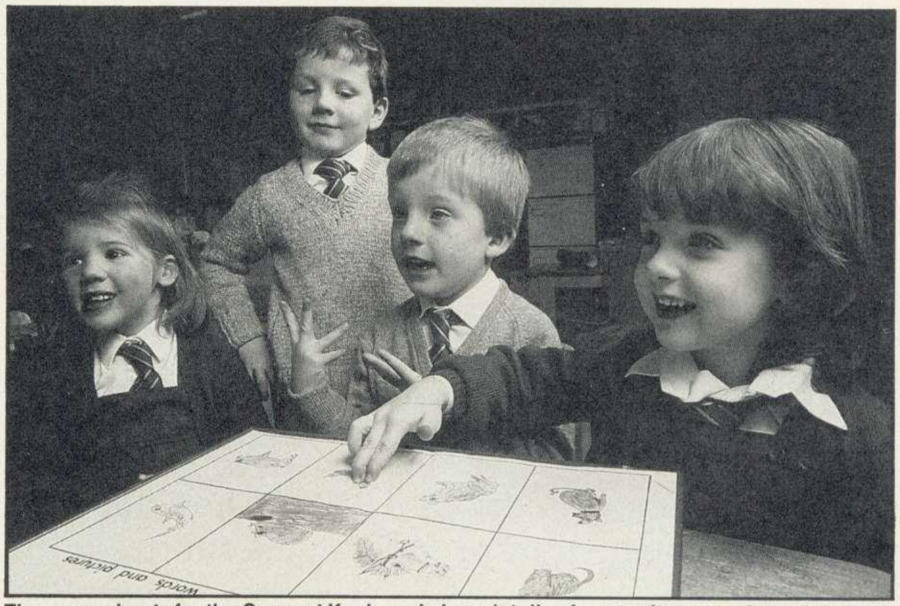
A NEWS-SHEET is available giving information about software and applications for the Concept keyboard. Produced by AB European Marketing, it also gives details of offers on kits from AB themselves.

For example, the Concept A4/128 Pack containing an A4/128 Concept keyboard, an interface lead, introductory software on disc, introductory overlay set and a User Guide is on offer to educational users at £99.50, saving £10.

The Starset Authoring package from AUCBE (Advisory Unit for Computer Based Education), which allows the user to create new overlays and edit existing ones, is available at £13.90 including disc-based software, an overlay pad of 25 sheets and a handbook.

Details from Kate Maxwell, AB European Marketing Division, Forest Farm Industrial Estate, Whitchurch, Cardiff CF4 7YS. Tel: (0222) 618336.

See Chris Drage's review of software for the Concept Keyboard on page 145.



The news-sheets for the Concept Keyboard gives details of new software and special offers

The future of the BBC micro

◀ *Continued from page 141*

thought in view of the fact that the industry will probably gallop ahead in its development plans whether we want it to or not.

Another problem is that the BBC micro, priced around £380 is not going to get any cheaper, contrary to popular opinion. Components are no longer decreasing in price and specialist chips have rocketed in cost and plummetted in availability.

Half-price

Other companies are offering micros with greater memory at lower prices and the Americans are trying to batter their way into the market by offering their equipment at half-price, so why should we stick with Acorn?

The answer has several facets. First, it would be folly to dismiss the vast amounts of work and resources already poured into the education market, both by software manufacturers and organisations such as MEP and its related bodies. There have been many short-comings in these ventures, not least that the software produced has often been of poor quality, but now, with those years of experience behind them, these organisations are beginning to bring the whole idea of educational computing into some sort of perspective. The wild ideas have passed by and what is left is a more solid foundation of knowledge and expertise.

Second, Acorn has a policy of educational involvement by which they attempt to support educational initiatives and bring about change within the curriculum to make it relevant to the needs of the 'information society'.

Third, those companies bringing their micros on to the market at cut-price rates are offering a very attractive alternative in terms of hardware, but as far as software goes, the user would be very much out on a limb with little support either from software houses or LEA groups. This is the case mainly because there has not been any great educational development scheme related to these machines.

Palatable

Trying to make classroom use of the micro relevant to the needs of the children going out into a world infested with the things is very tricky. The use to which a bank, for example, puts computers is a large step beyond classroom computing. The teacher has to relate the classroom use to the real world use in some way, at the same time keeping the materials palatable.

Simulations of industrial applications are becoming more commonplace nowadays. Computer-controlled lathes, common in manufacturing industry, are now becoming a feasible proposition for the classroom with self-help kits, advice and schemes from MEP and other sources. That sort of work is going to continue apace – with the BBC micro.

The advances in computer technology are also going to continue at a rapid rate. It is probably quite reasonable to conjecture that within the next five or 10 years the Beeb will be replaced completely in our computer catalogues by who knows what, or up-graded to such an extent that it is unrecognisable as the original.

Nonetheless, the lessons learned in our advances with this micro will be good foundation for future development and it is also undoubtedly true to say that five or 10 years hence there will still be plenty of use being made of this excellent machine and all the peripherals that have sprung into existence in its wake.

Robots move in on the classroom

MEDIA FOR use in control technology and robotics are becoming more easily available as schools show a greater interest in extending their base of computer use.

Not only are more schools taking up this aspect of technology but also the age-range that it is being used with is broadening, so that control work is being done by youngsters in the junior sector as well as the upper levels of secondary schools, largely because manufacturers are making the whole subject more 'friendly'.

Companies such as Lego, with its reputation for producing rugged hard-wearing playthings, has now branched into the technological side with 'Technical Lego', and the development of simple robotics equipment by companies such as Commotion has led to teachers being able to buy their hardware in an adaptable form, allowing them to create more than one unit of equipment from the same pieces.

Fischertechnik has had the same idea and the new Milton-Bradley construction kit has distinct possibilities for the technology classroom.

Development projects involving these kits are at the moment under way in MEP and it should not be long before the grass-roots see some results!

●**For more details of developments in robotics see page 72**

EXPLORING CONCEPTS

Chris Drage tests software for the Concept Keyboard in the classroom



The children's faces show their verdict on *Stories Suite*

LAST month I reviewed the Concept Keyboard from Star Microterminals – a touch sensitive keypad with 128 cells and handy A3 size which is a boon to teachers of younger children for whom the qwerty keyboard is an added burden.

Excellent though the device is, its real value to any educationalist can only be measured in terms of the software available for it, so this month I'm casting a critical eye over the quality and value of some. Armed with a Concept Keyboard I worked with children aged from five to nine and a number of 10-year-old remedial children.

Pre-reading Pack and Early Reading Pack

The Concept Keyboard lends itself to the area of language development. With good software, children are freed from the constraints of the qwerty keyboard and can explore a wide range of concepts important to their reading and language development. It is with this in mind that ESM have produced two very good packages, *Pre-reading Pack* and *Early Reading Pack*. The former aims to give very young children practice in matching pictures, shapes, letters and words, and the latter in sequencing, word recognition and simple sentences. A most pleasing feature of the pack is the facility for the teacher to write, edit and save his or her own questions.

Pre-reading comprises three programs: *Odd-One-Out, Football Match* and *Order*. Each program requires the child to move a witch, footballer or pointer to align with the correct match and press Return on the overlay. The overlay symbols are large and clear but lack colour. *Football Match* was undoubtedly the most popular of these with the children.

Early Reading also comprises three programs. *Sequences* aims to develop visual sequential memory and recall. A wide range of choices is offered to the teacher regarding the content. *Words* and *Sentences* provide exercises in visual association and discrimination through scanning and matching words in the first program, and sentences in the latter. The same care has been taken with this suite to ensure that a wide range of facilities are available to the teacher and the child. Again being able to write, edit and save the teacher's own questions is the real strength of this pack.

An added feature of this suite is that you can obtain a report, not only of the results of each attempt, but also of the average time taken for each input.

Stories Suite

Stories Suite, from Page Educational Software, is a structured set of six programs designed to aid language development from early word recognition, through story writing with whole word or phrase input, to reading-for-meaning exercises. The word files can be changed in most of the programs, and overlays made to supplement reading schemes. Children are encouraged to write by being able to touch and explore words and to see their stories in large, clear letters. They can also hear their words and stories, as some of the programs make use of the Votrax, Braid, Intex and Microvox speech systems.

The suite also includes utilities to generate reading-for-meaning material and for printing cloze exercises (where missing letters or words must be filled in) and accented languages: the range of reading problems covered is quite extensive.

The package, with 15 overlays and four function key strips, caters for a reading age range of four to 13-year-olds. Children really do benefit from being able to create their poems and stories on a suitable wordprocessor.

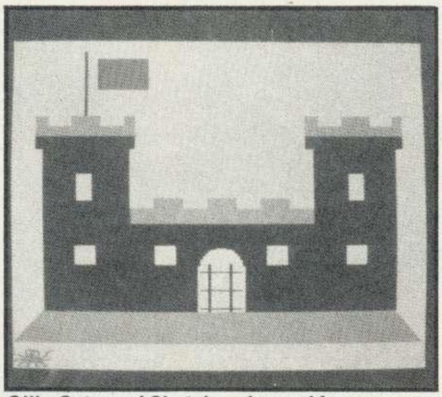
The program allows both qwerty and Concept Keyboard inputs and auditory output. Unfortunately, not having the necessary hardware, I cannot comment on the effectiveness of the speech synthesis option. The pleasing feature of this program is the large, colourful teletext characters. Up to five 'pages'

may be created, each being equivalent to a postcard of text, ie, 45-60 words. New sentences begin on new lines (following Ladybird Early Reader practice), and capital letters are automatically inserted at the start of a sentence.

Although some of these programs are available individually, it would be beneficial to purchase them as a suite. The package is extremely well designed and practical in its approach. Being content-free, the scope of *Stories Suite* is limited only by the teacher's imagination.

Maths Talk

Maths Talk from Learning and Training Systems is concerned with the appreciation of mathematical statements, ex-



***Ollie Octopus' Sketchpad*: good for younger children**

pressions and relationships, and the development of language in these areas.

The package comprises two programs – MTALK1 (addition and subtraction) and MTALK2 (multiplication and division).

The programs present a mathematical statement such as 6+3=9 or 9−6=3 and prompt the child to type in expressions which have the same meaning, eg, '6 plus 3 equals 9' and 'the difference between 9 and 6 is 3'. The program understands a total of 70 statements for any addition equation alone!

The child selects the type of equation; the program then presents 10 expressions in turn and requests the child to compose 10 equivalent statements for each one. Both correct and incorrect statements are listed on-screen and a report page is built up. The screen display of large teletext characters is both bold and clear. The inclusion of a free choice option is excellent – here the child is presented with three numbers with which to compose mathematically correct statements of his or her own choosing. Combinations of additions and subtractions are possible.

Maths Talk gives children the opportunity to express in words their understanding of numeric relationships and its value should not be underestimated.

PRICES AND PUBLISHERS

Pre-reading Pack £9.30 (£11 disc)
Early Reading Pack £9.30 (£11 disc)
ESM, Duke Street, Wisbech, Cambridge PE13 2AE

Maths Talk £7.95 (cassette or disc)
Learning and Training Systems, Haydon House, Alcester Road, Studley, Warwickshire B80 7AP

Ollie Octopus' Sketchpad £6.95 (disc £10.95)
A3 overlay sheets £1 each
Storm Software, Winchester House, Wootton Grove, Sherborne, Dorset

Stories Suite £25 (£30 disc)
(some programs are also available separately)
Page Educational Software, 17 Pagefield Crescent, Clitheroe, Lancashire BB7 1LH

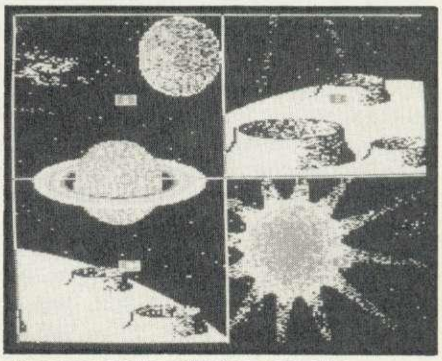
Jigsaw £11.95 (cassette or disc)
Sliding Block Puzzles £11.95 (cassette or disc)

Drawing Pictures and Puzzles £11.95 (cassette or disc)
Ega Beva Software, Central Trading Estate, 275-277 Bath Road, Bristol BS4 3EH

Ollie Octopus' Sketchpad

A number of younger children at my school have looked on enviously while the older children manipulate screen graphics using a light pen. When they try it themselves they have often been disappointed by their results. This can usually be attributed to their lack of fine hand/eye co-ordination. To the rescue comes *Ollie Octopus' Sketchpad*.

This delightful graphics package allows children to draw lines and



***Jigsaw*: popular with five-year-olds**

simple shapes in eight colours. Lines can be drawn in eight directions. It allows children just three basic shapes – squares, circles and triangles as 'building blocks' for drawing.

Once selected, a shape can be expanded or shrunk, coloured in or deleted. Pictures can be saved and reloaded. There can be no doubt that the strength of this package lies in its simplicity. Having just three shapes really makes children think about how they are going to 'build' that car or house. Another welcome feature is the overlay which provides alternative keypads for both left- and right-handed children – also a boon when two children are working together. Children really enjoy using a computer as an art medium and are often thrilled by their results. I would suggest that *Ollie Octopus' Sketchpad* provides a welcome introduction to the area of computer graphic art.

Jigsaw and Sliding Block Puzzles

Jigsaw and *Sliding Block Puzzles* from Ega Beva Software are related programs that allow screen pictures to be divided into between four and 25 subdivisions. Each picture is then shuffled and it is the child's task to reassemble the picture.

Of the two, *Sliding Block Puzzles* is definitely the more difficult task to perform. Each program comes complete with four pictures. Only disc versions of the programs are really practical in the classroom because of the excessive picture-loading times. Both the programs provide very useful, graded, perception tasks.

Drawing Pictures and Puzzles

Perhaps a more valuable program is Ega Beva's *Drawing Pictures and Puzzles* program, which includes the option of being able to draw your own picture. An element of *Jigsaw* and *Sliding Block Puzzles* is included in the package to enable the children's own pictures to become part of a jigsaw.

Conclusion

Each program reviewed here can be used with or without the Concept Keyboard attached. This is very wise, for at some point children must develop qwerty keyboard skills. I do not see the Concept Keyboard a valuable tool in its own right but as an important element in a child's acquisition of the skills necessary to interact with the machine. Combined with the right software the Concept Keyboard enables very young children or children with disabilities direct access to the content and concepts in the software in a natural, uncomplicated manner.

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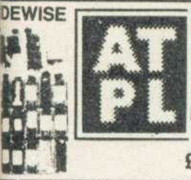
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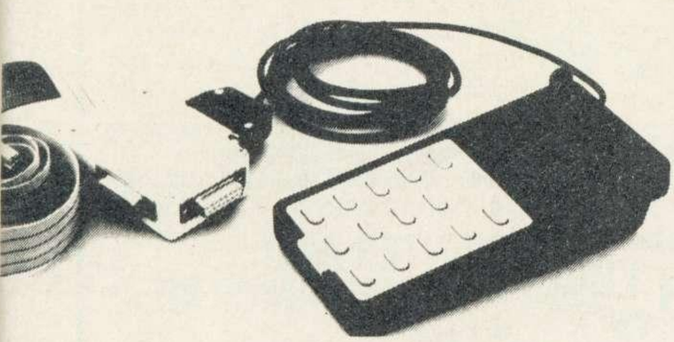


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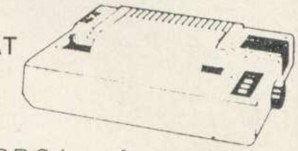
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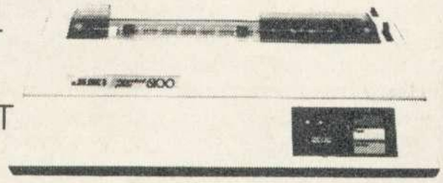
RX-80FT £225.25 + VAT
FX-80 £328.00 + VAT



Printer Price **includes** paper & BBC interface cable
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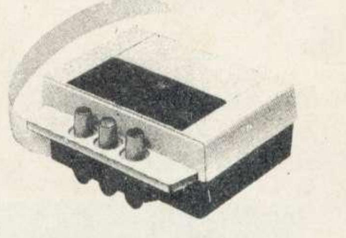
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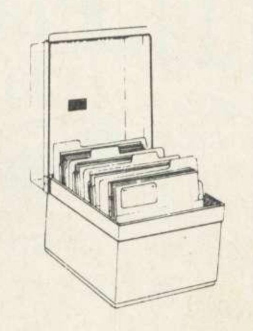
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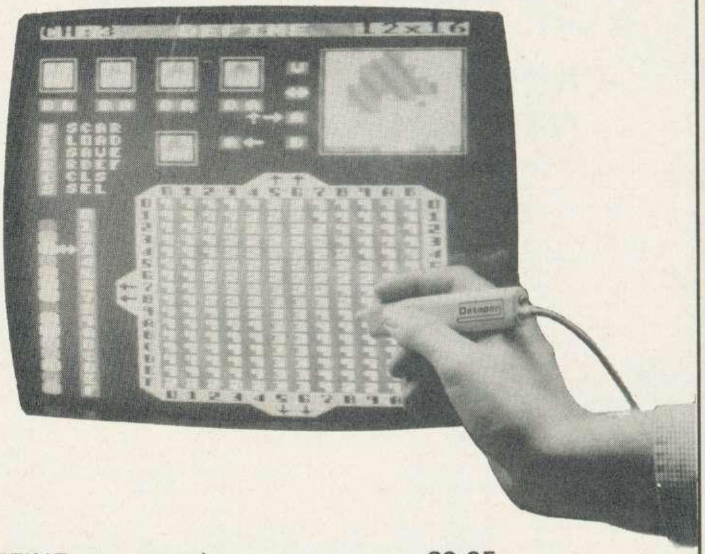
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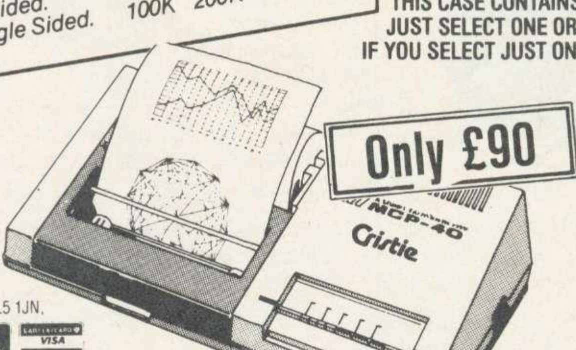
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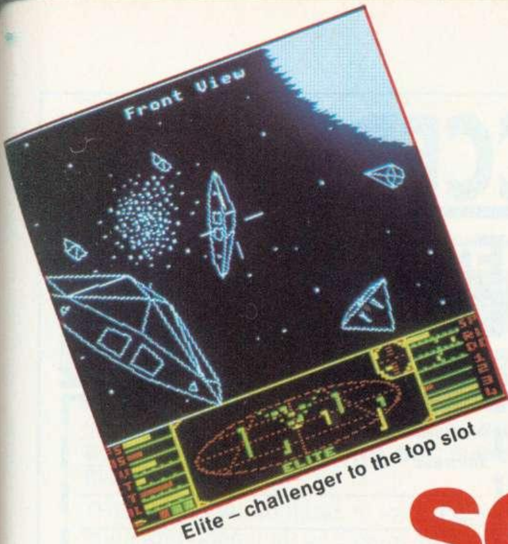
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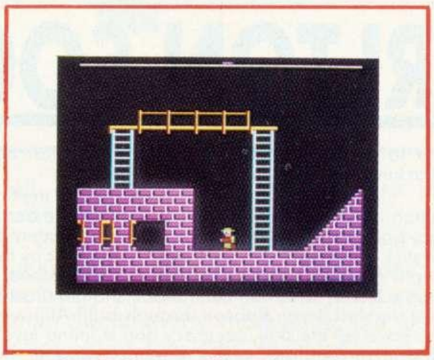
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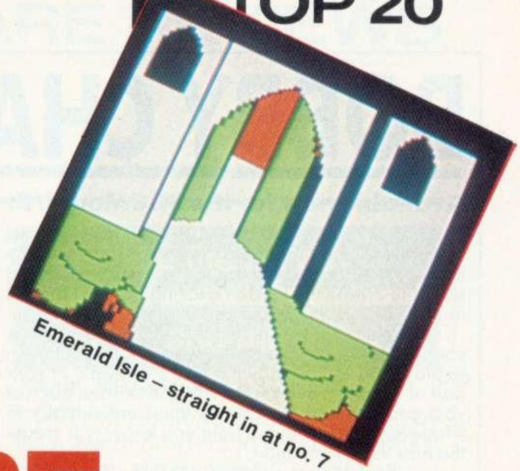
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	TITLE	PUBLISHER	PRICE	MICRO	REVIEWED
1 (1)	Castle Quest	Micro Power	£12.95 (£14.95)	B	March '85
2 (2)	Elite	Acornsoft	£14.95 (£17.95)	B/E	October '84
3 (12)	Combat Lynx	Durrell	£8.95	B/E	
4 (5)	Sabre Wulf	Ultimate	£9.95	B	
5 (-)	Tempest	Superior	£9.95 (£11.95)	B/E	
6 (8)	Football Manager	Addictive	£7.95	B	March '85
7 (-)	Emerald Isle	Level 9	£6.95	B	June '85
8 (-)	Tales of Arabian Nights	Interceptor	£6.00	B/E	
9 (3)	Blockbusters	Macsen	£7.95	B/E	
10 (-)	Cavemen Capers	Icon	£7.95	B/E	
11 (-)	Labyrinth	Acornsoft	£9.95 (£11.50)	E	
12 (11)	Eddie Kidd's Jump Challenge	Martech	£7.95	B/E	March '85
13 (10)	Scrabble	Leisure Genius	£12.95	B	
14 (re)	Chess	Various	£6-10	B/E	
15 (7)	Pole Position	Atarisoft	£9.99	B	February '85
16 (14)	Chukkie Egg	A & F	£7.95	B/E	September '84
17 (4)	3D Grand Prix	Software Invasion	£9.95 (£11.95)	B	February '85
18 (15)	Jet Pac	Ultimate	£7.95	B	
19 (6)	Frak!	Aardvark	£8.90	B	September '84
20 (re)	Return to Eden	Level 9	£9.95 (£11.95)	B	

B = BBC. E = Electron. re = re-entry. Prices in brackets are for disc version.

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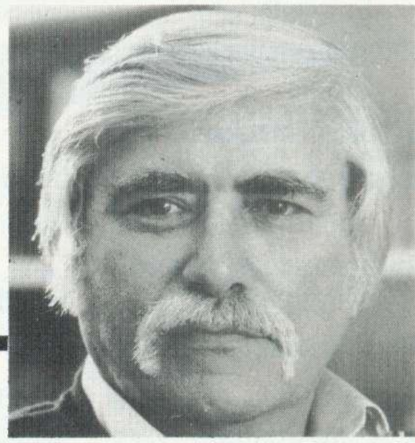
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More of a good thing

'Spaceman Sid', English Software, PO Box 43, Manchester M60 3AD, BBC B and Electron, £7.95

THE arcade world hates to lose a good thing and once it hit on *Space Invaders* it was determined not to let the idea go. One of the most recent variations is the space rover game, where the hapless hero not only has to avoid attackers from the depths of space, but also jump his buggy over craters and fend off nasties zooming in along the surface of the planet.

English Software's version of the game has most of the features of the original. The sprites are commendably



chunky with a rotund Sid in his sporty rover, large saucer-shaped aliens and rocks of two sizes bearing a strong resemblance to inverted strawberries. Drones charge towards you at awkward moments and various other obstacles have to be negotiated.

Every time you collide with something or are hit by anything, you lose one of five lives.

Things move fairly slowly, but it is still easy to drive yourself into a situation where there is no escape from swift and terrible destruction. When this happens, the buggy collapses in a burst of flying wheels, which bounce away most convincingly. The sound effects are nothing exciting, but adequate to convey the required events.

I found the game hard to play because of the choice of control keys. There are only four main ones; Z and X to accelerate and brake, Shift to jump and Return to fire bolts up and across the screen. It is all too easy (and usually fatal) to confuse these last two and plough straight into an obstacle. Surely, any new game which relies on keyboard control should cater for the player's choice of keys. To add to the difficulty, there were several occasions when the Fire key failed to respond at all, resulting in a premature loss of wheels.

English Software has acquired a deserved reputation for high quality software on the Atari machine. *Spaceman Sid* is, to my knowledge, the first release for the BBC. In most ways it lives up to their reputation.

Simon Williams

Chirpy chirpy cheap cheap

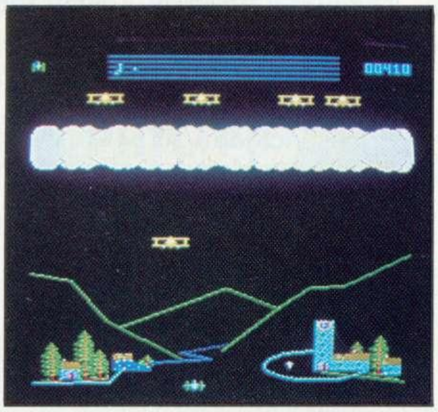
'Bird Strike', Firebird Software, BBC B, £2.50

I'M SURE the RSPCA will have something to say about this game – poor old pigeons being used by those nasty Nazimen to wing messages across the countryside indeed!

There you are, situated behind the controls of some gun turret, shooting down the poor blighters as the Luftwaffe comes down from the skies in waves of aeroplanes which increase in sophistication, not to mention bomb power, with each squadron.

And to what end you may ask yourself? To complete the stave of music at the top of the screen, to hear a chorus of *Colonel Bogey*. Pigeons fly across the screen chirping and generally minding their own business and the planes swoop down out of the sky from above the cloud bank to drop their loads.

You have three lives and can rattle across the ground to the left and right,



avoiding the bombs and planes. Hitting a pigeon or a plane is not too easy and reaps a reward of 120 or 200 points. With each bird hit the next note appears on the stave. If you manage to complete the tune before shooting down that squadron of planes you gain some extra bonus points and the next stave appears on the screen just waiting to be filled in!

The virtuoso Melvyn Wright provides the inspirational music while you load: this time it's *A Long Way to Tipperary*.

Bruce Smith

Take the money and run

'Swag', Micro Power, BBC, £6.95

FIRST impressions were not helped by a couple of howlers in the instructions: they read, at one point, '. . . you can get more (ammunition) by depositing god in the bank'. Then shortly after, '. . . you can stop this by drinking a can of bear . . .' I should think that George Burns and the brewers of Hofmeister (respectively) would be amused, too.

Carping over such errors may seem petty – until you realise that the program contains more than a couple of howlers as well.

Swag is a basic 'shoot, run and hide' game. The object is to collect bags of



diamonds to the value of £250,000 (which means, incidentally, that there is a limit past which no games master can travel). There are killer droids to be avoided and an opponent (either another player, in two-up mode, or the computer, in practice mode) for competition. If you hit a police car it follows you around until you can drink one of those 'bears'. There are one or two other wrinkles, but nothing to raise the game above the strictly ordinary. The bugs, if that's what they really were, were more annoying still.

In one-up mode I did quite well, thank you, without laying a finger on the keyboard, just watching the screen while the program regularly clocked up my score. I ran out of bullets after having selected 'unlimited ammo' mode (putting god in the bank made no difference either), and desperate for a can of 'bear', I kept shooting police cars without liquid results.

Playing in two-up mode (I thought I might win against a stationary opponent) didn't produce results either, because the 'finds' simply stopped appearing after a time.

If you enjoy this type of game, check it out, but it's definitely a case of try before you buy. **Ron Keeley**

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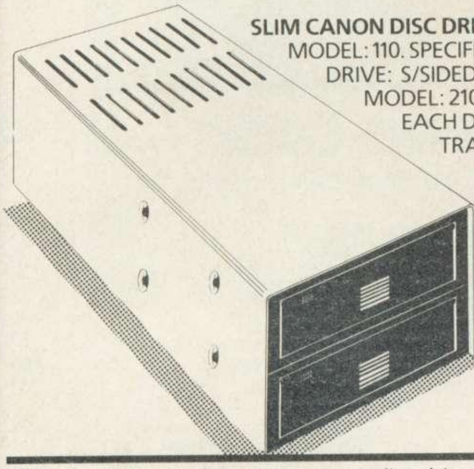
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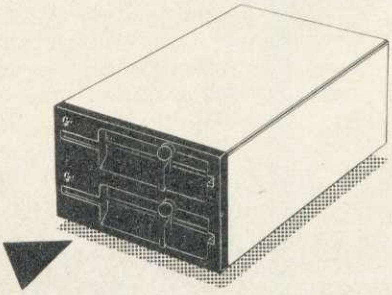
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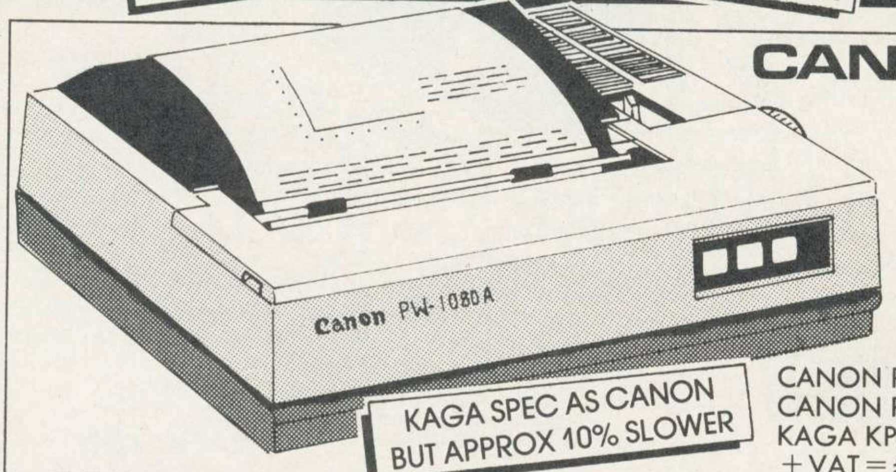
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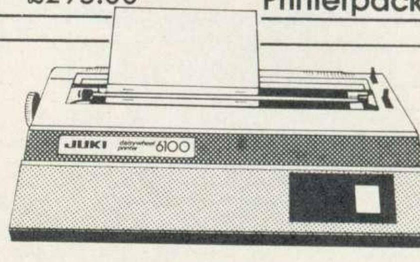
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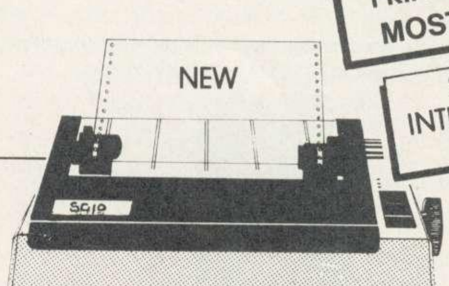
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Interplanetary flower show

'Flowers of Crystal', 4mation Educational Resources, Linden Lea, Rock Park, Barnstaple, Devon EX32 9AQ, BBC, £16.00, disc £17.65

WHAT'S the program all the nine to 11 year olds (and their teachers) are talking about? No, it's not the new Logos, excellent though they are, nor is it *Elite*. It's *Flowers of Crystal* from 4mation Educational Resources.

It follows in the wake of the enormously successful *Granny's Garden* and *Spacex*. *Flowers* is an adventure program in the same mould as the previous two but really goes far beyond both of them.



There are four parts to the package: an audio cassette recording of the story; parts 1 and 2 of the adventure; and a utility program that prints out worksheets for recording certain parts of the program. A story book and a hefty teacher's manual are also included to help you.

The scenario is based around the people on the planet Crystal, which is doomed because of the unscrupulous exploits of Mr Grubble and his bubble gum factory, destructive creatures called Blids and tourists!

Together they have brought the rare Crystal Flower to near extinction and without the flower, the planet will no longer exist. Children playing the adventure take the role of visitors from Earth who have to find magic objects hidden by the wise Rumala. These are used to bring about the regeneration of the Crystal Flower.

The program is in two parts. In part one, the four elements must be collected to cultivate the flower: special water; a gold pot; fertiliser; and soil. These each have to be found and brought back to the control centre. When they are assembled, the children move on to part two. Here, six parts of the Flower Dream must be found and taken to a castle to be assembled into segments of the complete picture.

The program is best attempted by children working in small groups as there are considerable advantages in shared decision-making. The program demands no particular expertise from the children, except the ability to use co-ordinates on a grid, but it does call for them to evaluate information carefully, to hypothesise and to assume a flexible approach to the construction of strategies. These skills will need to be fostered by the teacher, as failure in a program of this nature will lead to frustration despite the appealing characters and the abundance of first-class, mode 7 graphics.

At times children find the second part baffling and success depends a great deal on tenacity and learning from mistakes. The worksheets are certainly a great help here and all credit must go to 4mation for including a utility program to print out copies.

Flowers of Crystal can form the basis of a substantial and lengthy project with an immense range of possibilities for extension: conservation/pollution, coordinates, probability, writing and creative work. Perhaps more importantly, it encourages co-operation, discussion and thinking about each other's ideas. Without a doubt, *Flowers of Crystal* is an outstanding piece of software with enormous potential.

Chris Drage

All at sea in the canoe

'Emerald Isle', Level 9 Computing, BBC B, £6.95

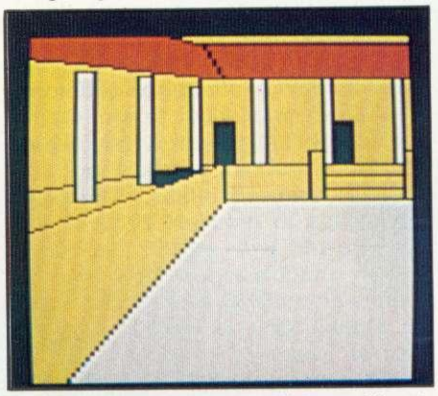
OKAY, I'll admit it up front. I'm not half as smart as Alice, but I reckon I'm a damned sight better looking.

Emerald Isle is a new offering from Level 9, the Torquemadas of the adventure trade. It has over 200 'rooms' each one with its own picture – that's right, picture. An adventure with graphics. Mind you, they're very reminiscent of the holiday snaps taken by my wife. You're left wondering quite what they're supposed to be pictures of. I haven't found any with people in them yet (at least my wife gets the odd ear or foot in hers) and I forgot all about them after a while and stayed with the text.

You start the game parachuting into the Emerald Isle and dangling from a tree as vulture bait. The object is to gather all the treasure together and present it in the appropriate place in the appropriate manner. I can't be more specific than that because it would spoil the game, and in any case, I don't know any more – I haven't finished yet. Oh all right, I've hardly started. I've got the canoe but I can't get the flaming thing into the sea. I've tried everything, including ATTACK CANOE. I've humped it all the way from the beach to the river (I'm not daft, rivers come out in the sea), but I couldn't put it in the river either.

At that point I was overcome by a great melancholy and threw myself in the water. And another thing, how do I get the lousy hammer? If I ever get it and meet the beggar, he'd better watch out as I'm in no mood to take a caring attitude to the disadvantaged. I'll just say 'It's not your lucky day, is it pal?' and POW! I've already attacked the seamstress, but that wasn't as much fun as I thought it was going to be.

All you lot out there with twisted minds and plenty of time on your hands are going to love this. No doubt several thousand clever-dicks will be writing in saying how easy it is to get the crummy canoe launched, and expressing surprise that I found it the least bit difficult. Well, it's not my fault that I'm of sound mind – or at least I was before this came through the letter-box.



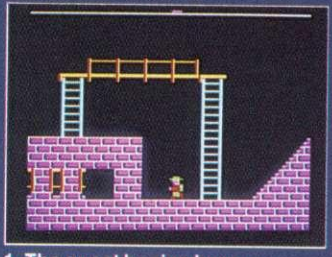
Level 9 provide a clue sheet which is almost as complicated as the game. It works on the linked list principle, with each entry pointing to another two. About halfway through you realise that you've forgotten what you were looking for in the first place.

I've tried all the usual naughty stuff like looking through the program for the keyword table but that didn't tell me anything I didn't already know. I wish Level 9 would provide reviewers with the solution so that we could be all superior and snooty about their feeble attempts to bamboozle us. As it is I'm getting some pretty funny looks on the bus with my sad little cries of 'To get the plank you need the hammer. To get the hammer you need the plank. Argh! KILL KING. Oh I hope I grow up to be like Alice.'

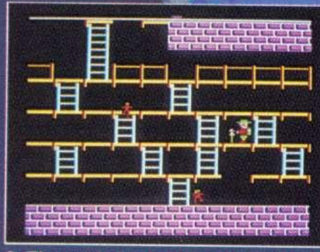
Now, where was I? CARRY CANOE NORTH. No. THROW CANOE NORTH. No. PUSH CANOE NORTH. No. EAT CANOE. . .

Harry Sinclair

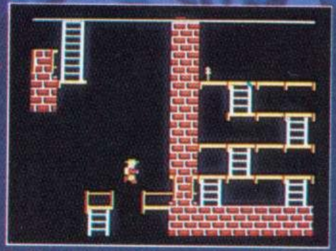




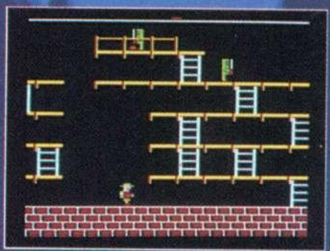
1. The quest begins here...



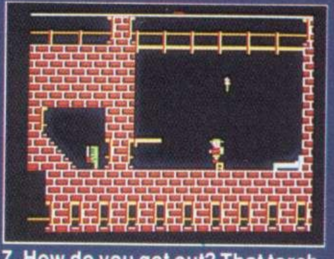
2. Through the lattice of corridors you come across a torch...



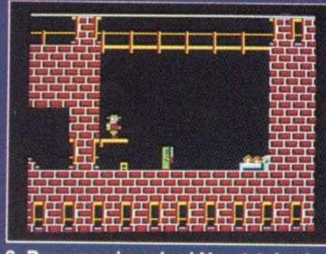
3. Up a ladder, you leap to the upper reaches of the castle...



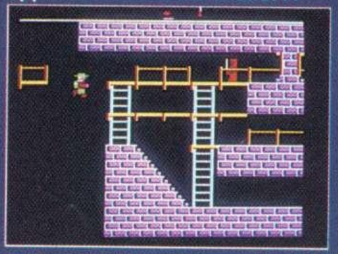
4. A red ruby is guarded closely. 'My kingdom for a sword...'



7. How do you get out? That torch might be useful...



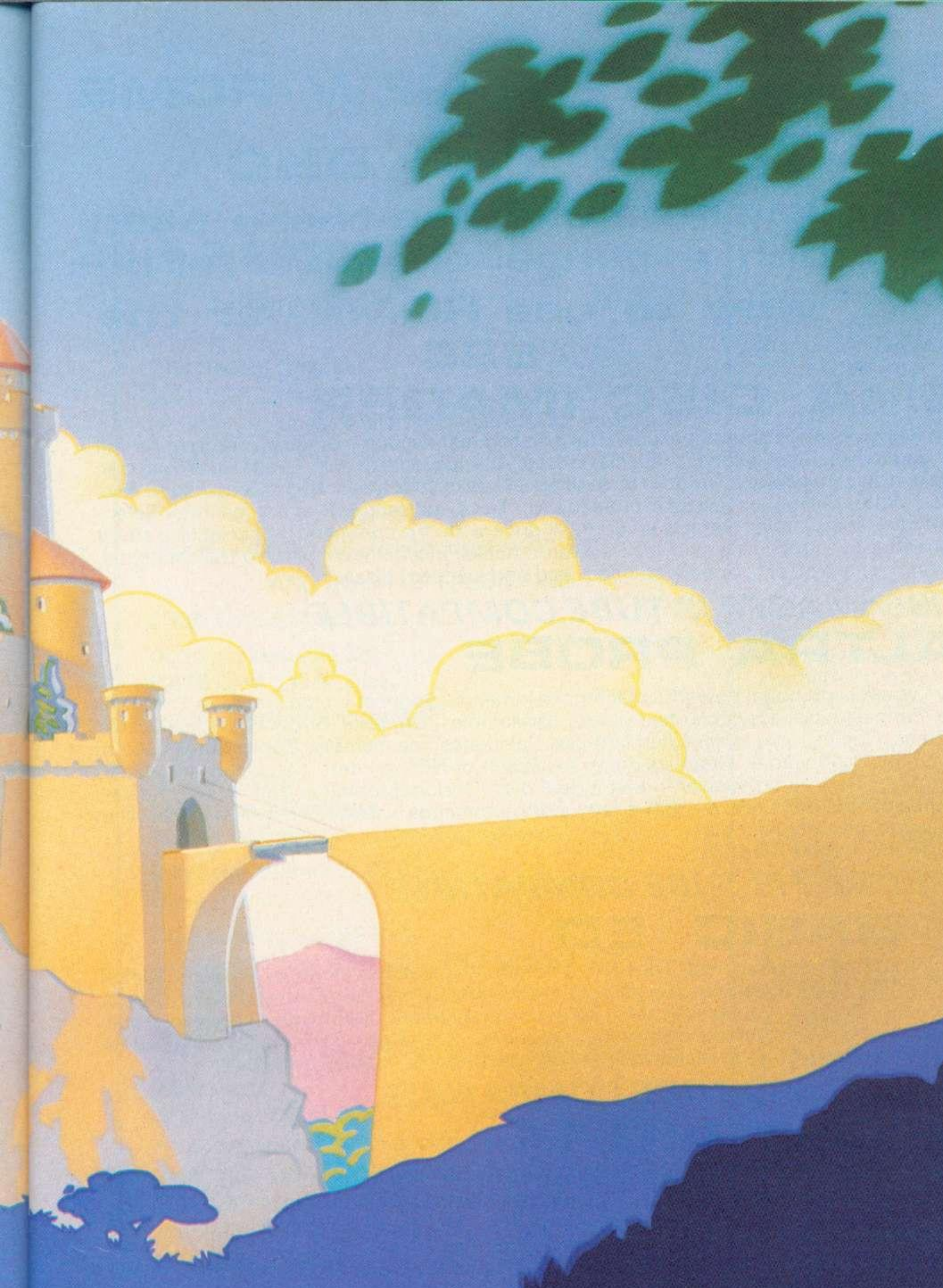
8. Pyromania rules! You tricked the guard; you get away...



9. It's a giant leap for mankind, but watch your head...



10. Swimming like a fish you make haste through the moat...



WIZARD TREASURE

'Castle Quest', Micro Power, BBC, £12.95 (disc £14.95)

WHY, you might ask yourself, is *Acorn User* devoting a two-page spread to *Castle Quest*? The answer is that it marks a major stepping stone in the development of games on the BBC micro, and, indeed, other machines.

Micro Power's *Castle Quest* introduces 'Scrollerama', hardware scrolling that has to be seen to be believed. In fact, the graphics throughout are very clever and have the witty Micro Power stamp all over them.

The adventure aspect is combined with finger dexterity and, most importantly, some hard lateral thinking – the problems are definitely challenging.

For those of you who missed the review in March, the aim of the game is to find the treasure hidden within the depths of the castle. However, to do this you must be capable of solving the numerous riddles that thwart your passage to the wizard's hoard.

One of the most fascinating aspects of *Castle Quest* is undoubtedly the graphics. A mode 2 screen is used throughout, gobbling up nearly 60 per cent of the BBC's memory. However, some ingenious programming by author Tony Sothcott (in his first attempt at a machine code game!) allows the actual map to be stored in a meagre 2k of memory. This is done using a building block base of just 13 items stored in a compressed form. The screen itself is arranged as a matrix of graphics blocks seven high by eight across – staggeringly, a single memory byte is used to represent two adjacent graphics blocks on the screen.

The scoring in *Castle Quest* is straightforward (well, reasonably so), with points for passing a particular location in the castle. There are six of these worth 10 points each, giving a possible total of 60. At the end of the game you receive 10 points for each life left, plus a further 10 for every item left in your back pack.

In addition there is a time bonus. You start with a maximum of 2550 points, but this reduces by 10 every 10 seconds. So don't hang around if you want to be in with a chance for the £500 prize being offered by Micro Power. The experts tell me that even if you know all the answers, it still takes around seven minutes to complete the adventure.

Bruce Smith



5. Into the spider's den: Little Miss Muffet didn't have these problems!



6. Beaten – you're escorted off to jail – the wizard looks on...



11. Back past the spider and on to meet the wicked witch...



12. A flying leap, but the witch is gaining on her broomstick...

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Altra Probe is available in two versions. PROBE 1 and PROBE 2

ALTRA PROBE 2 IS TUBE COMPATIBLE

BASIC ED

Basic Ed, is on 8K ROM which contains 21 additional commands. They are: $ search, List matches, Number matches, Global replace, Selective replace, Bad programme relink, Copy lines from one part of a programme to another, Format a listing, Move, Super pack, Renumber, Table line references, Unpack, Variables X ref, List entire programme, Keyboard immediate mode, Printer on/off, Paged mode on/off, List match lines, Concatenate, Strips rems, spaces etc. Altra Basic Ed. is an essential helpful tool for the Basic / Assembler programmer. Altra Basic Ed. is available in two versions. Basic Ed. 1 and Basic Ed. 2.

ALTRA BASIC ED. 2 IS TUBE COMPATIBLE

FIRST AID 1.1

First Aid 1.1 is an 8K ROM which contains 19 additional commands. They are: Machine code dissembler, Hex and ASCII dump. Sideways rom to ram copier, Function key predefined facilities, Variable table listing, Memory space free calculator, Checksum calculator, Rom lister, String search, Define function keys with strings, Rem and space Stripper, Bad programme fixer, Clear all variables, Clear ram from &0400 to &8000, Machine code monitor, First Aid 1.1 as a language, Lists O.S. calls with their vectors, Lists the first 24 control codes. Altra First Aid 1.1 was designed to assist the Basic / Assembler programmer and the sideways rom user.

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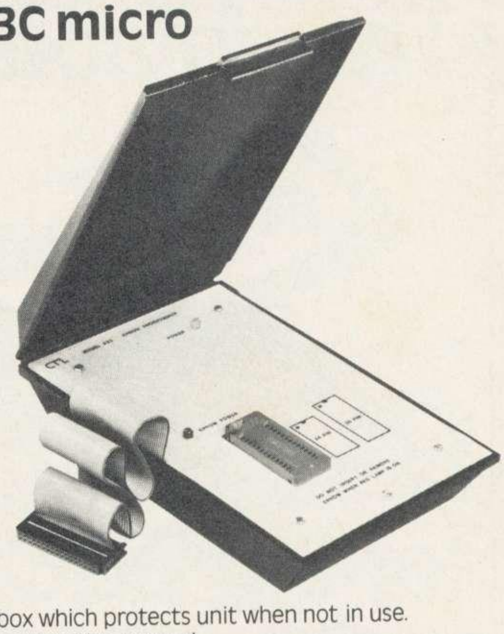
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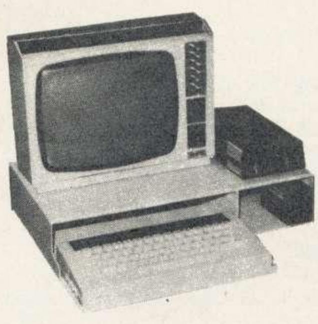
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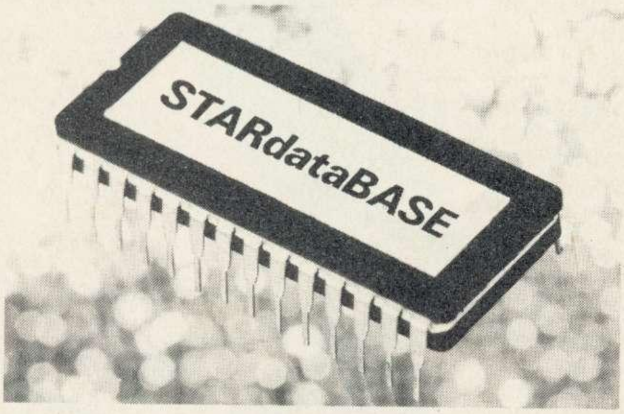
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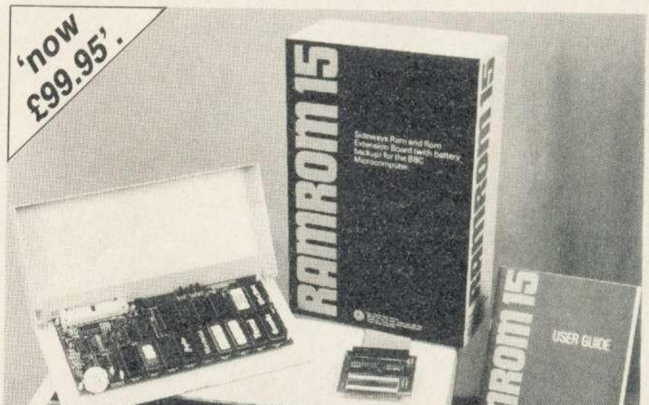
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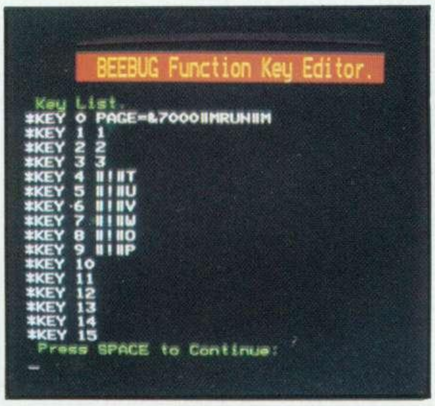
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Your starter of twelve

'Starter Pack', Beebugsoft, £13, disc £15.

THIS package of 12 programs aims to give the new user a start in life. On tape or disc come five utilities including a function key editor, a character definer, a Bad Program recovery unit, an editor and a sound utility.

Moreover there are several games – *Starfire,* a simple but quite gripping zapping game; *Block Blitz* – an arcade type; *Galactic Invasion* – space invaders; *Space Lords* – a two player game; a good version of *Reversi*, *Four in a row* – (Connect Four); and *Life;* plus



Football Krazy and *Mars Lander,* both for the Electron.

In addition to all of this mixed bag which does contain some really good stuff, there is a handbook of some fifty pages of advice and programming tips, a quick reference guide to practically all those things you need to look up in the User Guide and can never find, a set of screen planners, character planners and function key overlays. The package is well presented in a library case.

The reason for all these goodies coming together in one package is quite simple. The whole deal has been devised and put together by Beebug from their various magazine articles, reviews, hints and tips and programs. Over the past two years of their existence they have culled the best and most useful information that they consider a beginner will need to help them get started with their BBC micro or Electron.

This is not to say that the guide is an easy one – it isn't, and I think that they may have fallen gently into the trap of aiming over the user's head if he really is a true beginner. Nonetheless, with perseverance and the use of a bit of common sense this package represents one of the best starter packs that I have seen – mainly due to its variety and the wealth of experience upon which it is built. Well done, Beebugsoft.



Nick Evans

Sweet top drop

'Acid Drops', Firebird Software, BBC B, £2.50

SELLING at only £2.50, *Acid Drops*, distributed by British Telecom, is excellent value. Based on an arcade-style game, it is fast and furious, and if you are skilled you'll be able to move through the stages up to level 9 – as long as you avoid the 'acid drops'.

The idea is to destroy moths which fly



around the screen, while avoiding hitting the bath of acid at the top of the screen. If you do hit it, the acid drops will drip – if they touch you, it's curtains. As you try to avoid being destroyed by bombs, etc, a gate opens on the right-hand side of the screen. Once fully open and the moths have been destroyed, you assume flight mode and work your way through a maze to the next level.

You can freeze the program if you need a breather and you're serenaded with music as the program loads.

The whole package is most impressive and excellent value. It's certainly better than a bag of sweets!

Nick Evans

Those 'down under' blues

'Gold Digger', Firebird Software, BBC B, £2.50

NOW let me see if I've understood this – blue ones fall but gold ones don't – so much for Newton's Law, but then this game is about wingeing misers and I suppose even gravity doesn't come free and has to be paid for!

As you may have already gathered, this game is set 'Down Under' and you score points by digging your way through the goldmine and for every gold nugget you manage to pocket. Rocks are blue (but then isn't everything after 16 pints of Fosters?) and have the habit of getting in the way.

Then there are the natives (or misers as they are affectionately known) – six in all and every one a nasty piece of work. As you go around minding your own business, pocketing a few million here and there from the misers' mine, they chase after you. Your only real defence is to drop the blue rocks on their horrid little heads by tunneling under the rocks. To make things easy, first time out there is just the solitary miser in pursuit but the number increases as you progress.

Just like the average person, you have three lives. You must pocket the 13 gold nuggets, and if you succeed in doing that, then you gain another life.

To increase the tension you also have to beat the old clock, and the alarm bells begin to ring as your time runs low.

As you may have already learnt from the May issue of *Acorn User* (page 15), there is some lovely loading music produced by Melvyn Wright, which is well worth the cover price alone.

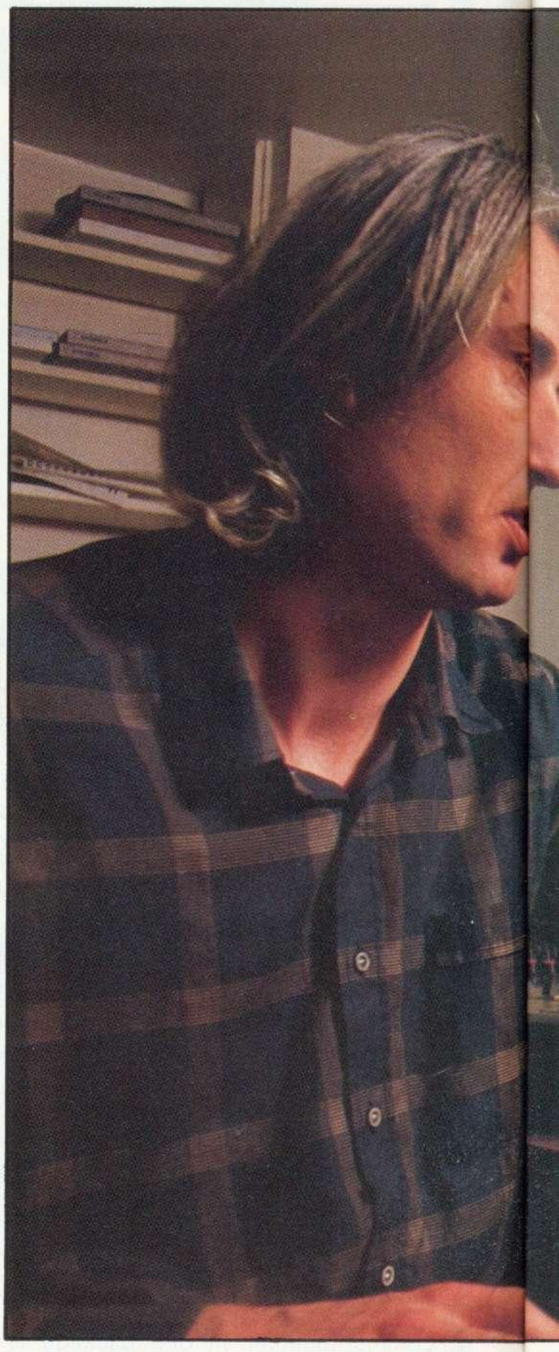
To summarise then, nothing too taxing but a good one for the kids (young and old) and well worth the £2.50 outlay. Gud' day!

Bruce Smith



THE SOUND OF SCIENCE

Ultravox, the pop group, are famed for their electronic hits. Members Christopher Cross and Peter Wood lend their ears to Acorn's Music 500



PHOTOGRAPH BY MICHELLE SMITH

ULTRAVOX has had a lot of experience with computers and music, and they usually fall into distinct areas – music and computers. These are like oil and water and don't mix, but we believe this doesn't have to be, and with the Music 500 Acorn has taken a large bite out of a very tough apple. All we need to do now is chew it and, hopefully, digest it.

Acorn, or rather Hybrid Technology who developed the 500, has approached the situation by going to the core of the problem – getting the computer to talk music. Input of music into a computer has traditionally been either through Basic programming or manuscript. However, the manuscript musical notation has been out of date or impractical for some time, and so has the Basic language to a certain extent as far as music and art are concerned. Obviously what is needed is a new music language, and Hybrid Technology with Acorn has developed Ample.

What does this mean in practical terms? Well, the manuscript goes in the bin and Basic goes back on the shelf, and we all return to school for a week or two to learn a new language. This is quite revolutionary, but perhaps because computers and music lie at two extremes a revolution is the only answer.

Opening the box is nearly always the most exciting part of a new purchase. With the Music 500 you get a book, a box, ribbon cable to the BBC micro and some software on disc. All you need to do now is nick the mains plug off a hairdryer, connect the box to your hi-fi, hit Shift and Break and off you go.

We suggest you now start your intensive study course and read the instruction book at least twice – we had to have the book on line permanently. Ample is not easy, but then no language encompassing all the areas the Music 500 attempts to cover could be. Learnt thoroughly, Ample is a very articulate music language and enables total control over the various sound parameters, ie, sound generation, loudness, envelopes, stereo panning, etc. All this can be written in or updated at any point during the performance, which makes the Music 500 a very flexible system.

We set about using the Music 500 in our normal working procedure – throw the book away, plug the machine in and play it by ear. Needless to say, within ten minutes we were knee deep in rubbish, looking for the instruction book in the bin. As with most new pieces of equipment, the hardest part is getting started.

After hearing the demonstration tape, we wanted to know how to use and understand this machine. At this point it became clear that you must *want* to use it and that this is definitely not a 'play in a day' electronic toy, but a serious attempt to design a music composer at a reasonable price.

What this system effectively gives you is an eight-channel music composer with its own discreet sound



source. In use, we found it quite fiddly to set up various sounds, so here's a tip from our experience. When you want a specific type of sound, the best and fastest way to get it is to find a sound similar to it on the demo tape, call up that sound for edit, modify it and when it is right, use it in your own composition or save it for future use.

By doing this you can quickly build up a library of your own sounds, and this is probably the easiest way to get to know the fundamentals of music, how to understand them and how to control them. The Ample language is a flexible, structured language; therefore it applies particularly well to music which is, as a rule, a structured concept that demands flexibility. This is especially true in popular forms of music, such as pop, rock and reggae, where you have similar patterns that repeat – intro, verse, chorus, verse, chorus, solo, repeat, finish, four beats to a bar, eight beats to a bar, etc.

After a few days of casual use, we found it quite easy to enter different sounds in the form of a song. At this point you can actually listen to what you have done and be more objective about it. Here you realise that what you've created is a computerised tune which sounds computerised. This is OK for BBC 2 sound-tracks, of course, but we found this was the stage where we wanted to humanise the piece. This is where Ample's flexibility is a real bonus for the creative musician.

It's possible to offset sounds very precisely, thereby feeding human error (or 'feel' as we call it), into a melody or rhythm. Many other elements enter the 'feel' areas – vibrato, tempo, pseudo-echo, accents and de-tuning – all of which are well within the capabilities of this piece of hardware. But remember that you only have eight channels, so if you want echo on one sound, you immediately use two of them. If you want a chorus effect on one sound this also uses two channels – obviously a limiting factor.

Unfortunately, there are no outputs for the separate channels which excludes the treatment of individual sounds with simple effects pedals, such as echo, chorus, etc. So what we really

have here is a very self-contained unit which has a limited use outside the home. It certainly isn't for the budding pop-star, but it is ideal for the Beeb owner who wishes to play the music adventure game.

Conclusions

For a first attempt at an add-on music unit for the Beeb, the Music 500 at £199 represents pretty good value. It became obvious that it was designed for the computer buff and not for the musician, and had there been more consultation between the two spheres at an earlier stage we feel that several improvements could have been made to simplify its operation.

Some standard pre-set sounds could have been included so that your brain could be engaged creatively on developing your composition instead of being frazzled by the frustrations of sound generation.

We would also suggest that a simpler and more versatile system be developed for entering information, ie, a graphic keyboard, an add-on musical keyboard or maybe a voice-activated system where you can whistle a tune in and this would be translated to the computer (assuming someone doesn't invent a brain interface in the next six weeks!).

MIDI (Musical Instrument Digital Interface) connections would be very useful for sending information to higher quality synthesisers and to synthesisers containing sounds you particularly want to use.

A clock-out would enable the use of an external drum machine, making the eight internal channels far more flexible, as would separate outputs for each channel, enabling the external treatment (echo, reverb, etc) of individual sounds.

In general, we found the Music 500 lacked a certain fun element making it quite dull to use, probably because we are used to using far more expensive dedicated instruments (but then some stuff costing £50,000 isn't that useful, never mind £200).

These suggestions would, of course, increase the price somewhat but would make the Music 500 far more versatile and bring it in line with the big boys.

The race is on for the Ample language, which has a great future. The Music 500 is a good start and with some further careful development it could gain the strength needed to be a serious contender in the race. All in all, this system has the potential to be a winner but has been held back by the lack of training.

Thanks to Technomatic, London, for the loan of equipment.

BROM

21 EXTRA COMMANDS

THE NUMBER ONE

TOOLKIT ROM
FROM CLARES

BROM [EPROM] £34.50 [DISC 40 80 3"] £27.50

BROM is the first toolkit ROM to provide a FULL SCREEN EDITOR, which means that you can scroll your program up and down just like WORDWISE does with text, do not confuse this powerful editor with the line editor used in other toolkit ROMs. The EDITOR allows insertion and deletion of lines and insert and overwrite within a line. This is the editor that the BBC micro should have had.

Closely related to the EDITOR is the EXTENDED ERROR HANDLING which will trap errors in a program and enter the EDITOR at the line generating the error, not only that but it will also position the cursor as near to the statement causing the error as possible, no more wading through multi statement lines trying to identify the error.

Commands unique to BROM are:

ROMON & ROMOFF which enable you to turn on/off sideways ROMs so that they stay off even after CTRL/BREAK, very useful for avoiding clashes especially for users with second processors. This also works with the DFS and reverts to PAGE &EOO automatically.

CASE which forces input into upper or lower case irrespective of caps/shift lock.

FLIST which lists a program one statement to a line but more importantly it will even list 'BAD PROGRAMS.'

ONEKEY is a single key entry option but you can also define your own strings to any ASCII key, just like an extra 48 function keys.

Another group of commands provide FIND and selective or global SEARCH and REPLACE facilities. These commands work with strings and keywords or a mixture of both e.g. "*FIND PROChelp T', will list the full line containing PROChelp, the 'T' simply tokenizes any keywords.

Yet another group of commands allow lines to be moved or copied to a new location.

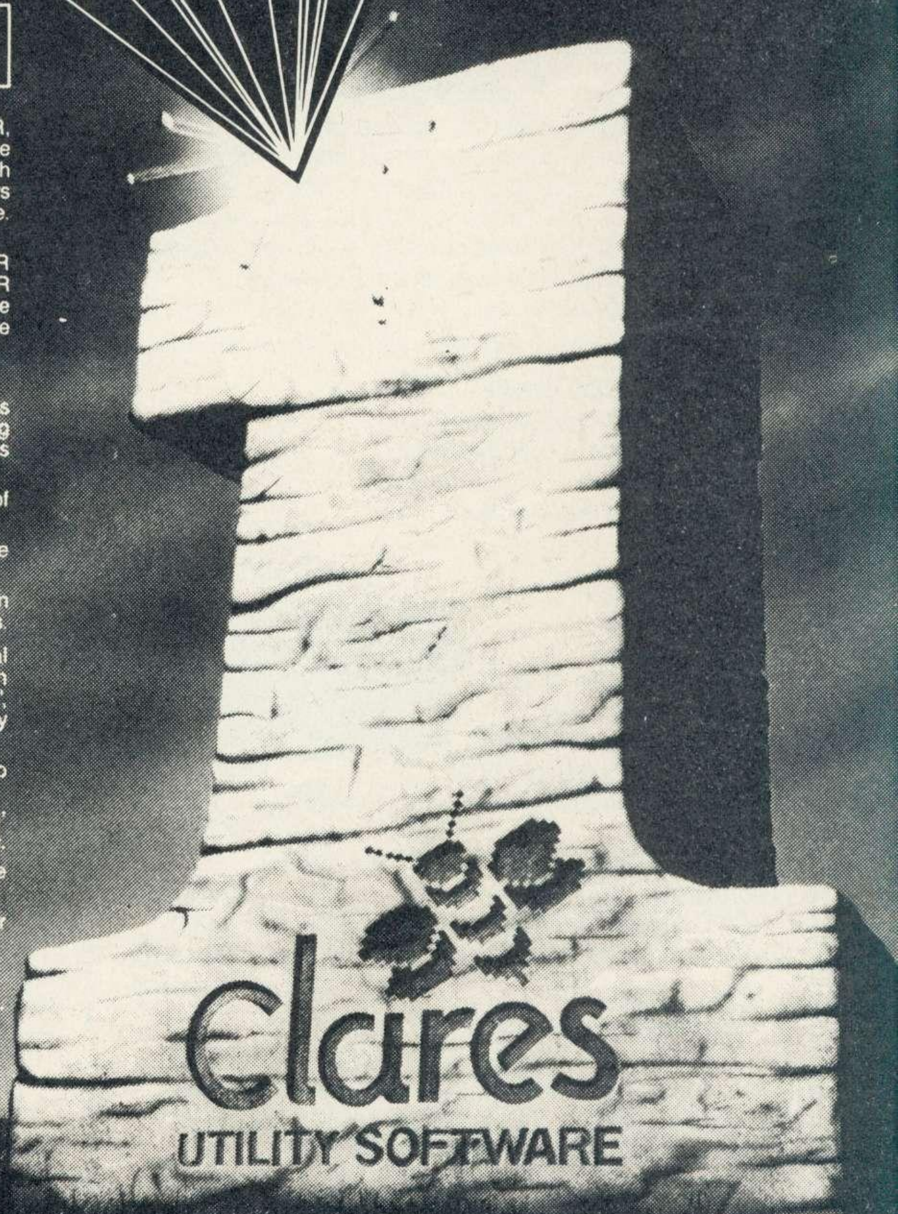
The other commands provide function key editor, 'BAD PROGRAM' cure, variable lister, integer variable flush, program compacter etc.

This is a genuinely useful ROM that no user should be without. Be warned, once used you will not be able to live without it!

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Viewfax Tubelink & ACORN USER.

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[EPROM] ———— EPROM

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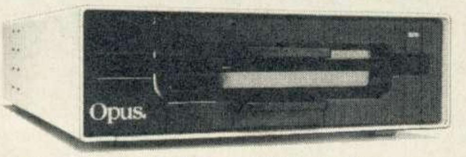
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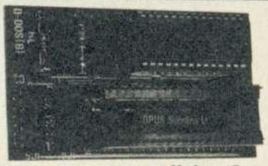
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We've been inundated with Free Ads — more than twice as many as we can carry. This has led to delays in publication and disappointment for readers. The Free Ads are carried in the magazine as space permits, so please allow up to three months for yours to appear.

Acorn User has been alerted to the abuse of the free ad service and, regrettably, can no longer accept entries selling or swapping software.

QUINKEY Microwriter keyboard complete with interface, software and instruction booklet; in original packages, £37. System assembler ROM with utility disc and manual (requires text editor, eg, Wordwise or View). £25. Tel: 0532 789 381.

FOR SALE Opus 5¼" dual disc drive, 200k/400k 40 track. Still under warranty, excellent condition. £200. Tel: Ken on 01-346 3742 evenings/weekends.

TANDY TRS80 Model III 48k, integral disc drives and Tandy printer Model VIII. Superb condition and working order. Both boxed with manuals. VisiCalc, other programs, various books. £595. Tel: Eastbourne (0323) 33088.

Z80 Acorn second processor, includes all original software, boxed, £280. Tel: Southampton (0703) 773141 evenings, 781042 daytime.

BBC B issue 7, Pace 400k 40/80 track drive, Epson FX80 printer, 3T07 cassette, two joysticks, lightpen, ATPL Romboard, Exmon, Graphics, Toolstar, Toolkit, Starstick, Wordwise, Fontrom, Caretaker, Printmaster, DNFS, 250+ games. £1500. Phone (0525) 713195.

PRINTER – cheapest ever Model 84 Creed teleprinter with stand, interface, cable, cunning software giving full character set by overprinting. Good condition. Only £30 including delivery in Avon area: less if collected. 0272 423549.

DISC DRIVE Cumana single sided 40 track with integral power supply. Includes manual and formatting disc. £80. Tel: 021-454 4307.

CLEF programmable stereo digital synthesiser, five octave keyboard, for use with BBC B on 1 MHz bus. Complete with software disc. Cost £495, accept £375. Tel: Alan on 0782 314053 after 7.30 pm.

ACORN Atom fully expanded with FP & Toolkit ROMs, also disc drive with PSU and 12" green VDU, plus assorted documentation. Any reasonable offer. Phone after 7 pm or weekends. Wellingborough (0933) 663487.

STROBE plotter for sale, BBC Plot software and cables, as new, £220 ono. Phone 01-340 2318.

COMMUNICATIONS software wanted for BBC B. Need program to auto-dial numbers in a list, and to store those answered by a modem. Will pay reasonable prices. Phone: Darren, (0253) 592151 (Blackpool).

PRISM acoustic modem with cables and software for BBC, £30 ono. Tel: 0689 38101 (Orpington, Kent).

CUMANA disc drive for sale, 400k double sided, (CS × 400), 80 track, very little used. Including manual and formatting disc. £150. Tel: Maldon (Essex) 741513, evenings only.

WANTED BBC B. Software, magazines, etc, not essential. Ring Banbury (0295) 811844, after 4pm.

BBC B, Sanyo hi-res green screen, Viglen ROM cartridge expansion system, Kenda Mighty Oak professional DMFS supporting double side double density on Teac FD55F drive. Cost £900+, sell for £720. Richard, Harlow 26586.

WANTED: contact in Britain with view to exchange information and programs for the BBC model B. Write to Edwin Dingjan, Melkpotte 28, 2631 pw, Nootdorp, The Netherlands.

BBC USER in New Zealand wants contact in UK to swap info, tips, software, etc. Write to Nigel Keenan, 22rd Peel Forest, South Canterbury, New Zealand.

BBC model A + 32k Acorn speech, user port, VIA chip, 1.2OS, serious offers please. London location but phone: 0377 46001.

ACORN Electron with Plus 1 interface, Acorn cassette recorder, many Acornsoft and Micropower titles, books and joystick. Worth £450+, fully guaranteed. £300 ono. Tel: Ipswich (0473) 73203.

WANTED Replacement ribbons for Nascom Imp printer. Where and how much? Also control codes for use with View. Ideally, printer driver required. Information to Mark Ballard, 78 The Avenue, Fareham, Hampshire PO14 1PB.

SIR Computers ROM board, latest model, manual included, £30 ono. Offers to Peter Smith, 01-341 6950.

WANTED: dot-matrix printer, for example, Canon PW1080, Kaga KP810 or similar. Also disc drive wanted in good condition, suitable for BBC B +DFS. Phone price to 01-394 1499 (evenings) or write to 49 Sunnymede Avenue, Ewell, Epsom, Surrey KT19 9TH.

1.2OS ROM £7.50. British Micro BBC Graphpad with software £110. RH Electronics colour lightpen with colour graphic cassette £45. All new. Phone Roger, 061-799 9845 (Manchester) evenings.

Z80 second processor, as new, boxed, complete with all associated software, etc. Bargain at £335. Phone Bagshot (0276) 75672.

BROTHER M1009 printer, tractor feed, Centronics cable and 2000 sheets of paper, £180. Comes with 11 month guarantee. Telephone 041-946 9110 any time after 7 pm. Buyer must pay postage on paper, if wanted.

CENTRONICS printers cheap! Two Centronics 102A printers, table top model, too big and heavy for my use. £25 each or £40 the pair, as seen. Buyer collects. Tel: Merstham (Surrey) 2853.

6502 second processor, recently received competition prize, unopened, guaranteed, quick sale so only £185 ono. Tel: (0222) 531272.

WANTED BBC model B OS1.2 with disc drive, manual and any software. Pay around £350. Tel: Keith on Welwyn Garden (07073) 29325 evenings after 7 pm.

LVL dual 100k drives, utilities disc, manual and box, 10 discs. Owner upgrading. Prism acoustic modem, complete and still boxed, £25. Tony Blake, Dunstable 601013.

MITSUBISHI double-sided 80-track 400k single disc drive. Boxed as new, still under guarantee. Complete with cables, manual, utilities disc. Tel: Droitwich (0905) 771908. £170.

200k disc drive for sale. BASF 40 track d/sided. Complete with case, all leads, manual and formatting disc. Used for two months only. £90. Tel: (0978) 842156.

BBC B with speech processor, APTL expansion board, 6502 second proc. Disc drive, 12" colour monitor, software, discs, ROMs, mags, books. All together or separately. Offers preferred. Tel: Kelvin, Hoddesdon (0992) 465000.

WANTED for Atom: Alphanumeric code breaking program. Also Super Racetrack; any games considered. Also Meanies, Blockbuster, Stock Market, Africa Diamond, Adventure 1. Details to Martin, 29 Canford Drive, Addlestone, Surrey.

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Sell your old hardware or pass on information. Fill in the form below to a maximum of 32 words (one in each box) and send it to Acorn User Free Ads, 68 Long Acre, London WC2E 9JH. Use capital letters, and remember your name, address or telephone number. Without this full information, supplied on a separate sheet of paper, we regret that we cannot carry your Free Ad. This is a service to readers – no companies please. One entry per form only, and we cannot guarantee any issue.

ACORN USER ADVERTISEMENT PAGES – JUNE ISSUE

BELTECH: APRIL ISSUE: ERRATUM

Owing to an error the advertisement which appeared on page 158 was not as per Beltech's instructions and contained out of date prices. This was **not** Beltech's mistake and we apologise for any inconvenience caused.

■ **Backups** of your valuable protected disc software are essential for your peace of mind. TWIN will provide them for 40 or 80-track discs – never known to fail. £8. J. E. Connett, Dene Croft, Westcott Street, Westcott, Dorking, Surrey RH4 3NY.

■ **Designer** EPROM. PROGRAM your BBC with Character Definer, Teletext Screen Designer (with program generator) and Extended Trace facility. PROTECT your BBC with your name and address displayed at switch on. PERSONALISE your BBC with function keys automatically programmed to your definitions. All on one EPROM, only £15. SwanSoft, 53 Orchard Way, Thorpe Willoughby, Selby, N. Yorks YO8 9NE. Telephone: (0757) 704134.

■ **'D-Master':** The most powerful disc backup program seen so far: £7. Nutcracker owners: £3. Handles sectors from 128-2048 bytes, deleted or not, etc. R-Soft, 22 Marriotts Close, Felmersham, Beds MK43 7HD. 0234-781730.

■ **Stop memory** clearing on Break! This utility program will keep memory intact after Break is pressed. £3 inc p&p. A Reeley, 44 Chelworth Road, Birmingham B38 0AE.

■ **BBC B** Basic 1/2 compiler (ROM) £49.95, symbolic disassembler (disc) £19.95, or sae for details to: Logik Engineers, 84 Portnalls Road, Coulsdon, Surrey CR3 3DE (mail order only).

■ **Copycat 4** The ultimate disc-disc backup utility. Superior to all known rivals: now with super new utilities included as standard. 40/80 disc £8.95. Integral Software, 11 Grove Park, Bangor, Co Down BT20 5QG. 0247 463603.

■ **Z80** Acorn second processor wanted with all original software. Sensible prices please. Tel: Newcastle upon Tyne 2731194 or 2661610 office hours.

■ **BBC B,** Torch disc pack, Perfect software, Z80 BBC Basic, manuals, 20 DD discs. Cost £1600, Nov 84: accept £1100. Winchester 68172. Includes MP165(NLQ) printer.

■ **3M** diskettes. $5\frac{1}{4}$" SS/DD 48 TPI twin-pack £3.75, 5 twin-packs £15.50 (p&p free). Cheque with order, please, to R C Pendle, 7 Manor Drive, Hanworth, Middx TW13 6RR.

■ **Macintosh 128k,** Forth, Pascal, 68k MASM, full tech doc, assorted software, mint condition. Genuine reason for sale. £1500 ono. Phone Mad Alex on 01-836 2441 (daytime).

■ **Circuit** Draw electronic diagrams with your BBC B – as seen on 4-Computer Buffs. Disc only. Sae for details. P Langwade, 20 Esher Road, East Molesey, Surrey.

■ **Numeric** keypad, BT-style (uncased). Connects to user port. Fully programmable. Software supplied on 40/80-track disc or cassette (please state). £16 inc. Cumbria Software Systems, 13 Burnrigg, Carlisle CA4 9BH.

■ **Disc based** bank accounts program. Maintains up to 9 bank, building society or credit accounts. Credits, debits, standing orders plus transfers between accounts and statement printouts. Clear, easy-to-use displays. 80/40 track disc and manual for £6.95 from Malvern Software, 4 Bastonford Villas, Bastonford, Powick, Worcester WR2 4SL.

■ **Probability** simulations. Teacher written for a class project. Extensive teachers' notes on a *Wordwise* file. Menu driven disc for £8.50. M Brooke, Shackleton School, BFPO 38.

■ **Be a** horse racing expert overnight with this simple program. No previous racing knowledge required. Sae to Longbow Investments, 34 Hill Road, Neath Abbey, Neath, West Glam.

■ **Geology** Hand specimen identification. 'Igneous', 'Sediment', 'Identimin' – programs of A-level standard, BBC B. £8 each cassette or details from Micro Prof, 68 Ferndown Road, Solihull B91 2BA.

■ **Fiendish** adventures – BBC/Electron. *Staff of Law* 'extremely fiendish. . . excellent', Electron User. Also, *Super Agent Flint* and *Galadriel in Distress,* £2.95 each inclusive. Potter Programs, 7 Warren Close, Sandhurst, Camberley, Surrey.

■ **Modems!** Miracle WS 2000 + BBC lead £143. Nightingale £116.50, or with Commstar £135.50. Prices inc. p&p and VAT. Squirrel's Byte, 7 Coniston Road, Melton Mowbray, Leics. (0664) 63617.

■ **Mouses!** AMX Mouse + control software on ROM, design software on disc, 2 manuals. Special offer: inclusive price, £76.95. Squirrel's Byte, 7 Coniston Road, Melton Mowbray, Leics. (0664) 63617.

■ **Easytalk** EPROM extends Acorn speech system – phonemes give infinite vocabulary, also numbers, prices, speaking clock, alarm. £21.95. Galaxy Software, 123 Links Drive, Solihull B91 2DJ.

■ **DDT** for your computing peace of mind. If you save data to disc and wish to be sure you can always recover it again – you need DDT. Sae for full details to Data-Fixa, 117 St John's Road, Exmouth, Devon EX8 4EH.

■ **Ikon Ultradrive** Fast tape filing system, hardly used. Includes leads, OS ROM, instruction booklet and 3 boxes of brand new tapes (21 × 140k storage in all). £80 ono. Penrith (0768) 66210.

■ **Chemistry** software: 16+ to 19+. Organic, Inorganic and Physical Chemistry. Assessment CAL simulations and games. Discs and cassettes. Stamped sae for catalogue to: G A Herdman Educational Software, 43 Saint Johns Drive, Clarborough, Retford DN22 9NN.

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ACORN ABUSER'S Diary

No claims on View Plus

ROB McRaker of Acornsoft continues to be his usual evasive self. When asked to confirm or deny rumours of the forthcoming wordprocessor *View* 3.0 (with all those bugs in 2.1 cured), he replied: 'We never deny anything, we just claim things'.

It appears, however, that Acornsoft has not claimed the lease on the flashy new building named after the late poet laureate John Betjeman, which the company shares with the local radio station. A prominent 'For sale' sign has gone up in the front garden. Tough luck team.

Meanwhile, a lovely tit-bit has dropped in from Computer Concepts, Acornsoft's arch-wordprocessor rival. Apparently the big boss, Chaz 'Chubby Chops' Moir loves Mr Men yoghurts, his favourite flavour being Mr Greedy!



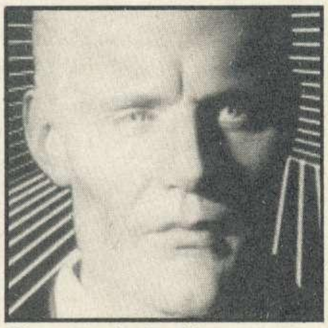
Evasive McRaker

Punter Pete

THERE have been developments surrounding the disappearance of the AVC900, a video version of the now defunct ABC range, reported here last month.

It now appears that the only working model of Peter Ryvita himself has been stolen from under Acorn's nose. Acorn denies that a redundancy payment fiddle is involved.

Reports are coming in that he has been sighted in a sweat-shop in the notorious Mill Road peripheral district of Cambridge, where it is said that undergraduates are converting second-hand chauffered punts into Econet file-servers under squalid conditions.



Clive – empire trouble

Uncle Clive's empire trouble

POOR old Uncle Clive still seems to be having trouble with his empire. You can hardly have missed the eight-page 'QuLour Supplement' advertisements in recent magazines for the wondrous modem system, etc.

But we can now reveal that the suppliers of the Q-COM package went bankrupt even before the advert appeared in print! And as for the IEEE-488 add-on, well it's a pity there's no software for it, but I'm sure some 68000 expert will soon solve that problem.

RIP off

IT IS with great sorrow that we must report the demise of Mike (or is it Peter?) Bibby's 'Introduction to Programming' series just before its second birthday.

The series has become quite a personality at Database Publications, appearing in at least three of its titles during its meandering career. However, it seems certain that another of the long-suffering re-write team will follow in Mike's footsteps and carry this engrossing partwork into perpetuity. RIP.



Ryvita – stolen

Max effect

CHANNEL 4 refuses to confirm rumours that the synthetic personality Max Headroom, who hosts the new Saturday music spot, is partly generated by a BBC micro.

Media watchers have detected a distinct similarity between the pin-striped background on which Max appears and the effect produced by some kinds of faulty video ULA.

Will applications for the illustrious Beebon ever end?

No name babe

DESPITE noises in the William Hickey column of the *Daily Express* ('Computer millionaire's love-child' etc) a name has yet to emerge for Chris Curry's heir-apparent. Perhaps the reason Cherry Hinton has shown so little activity in past weeks has something to do with not waking the baby?

Black home

THE return of illustrious sales manager 'Smokin' Joe Black from Acorn's crumbling American operation has been greeted with enthusiasm by Cambridgeshire breweries. But even more relieved is the proprieter of Joe's favourite fodder-stop, the restaurant Panos.

Moves are afoot to present a complimentary 32016 second processor to the restaurant in recognition of Acorn's operating system for the machine of the same name!

Quantum depths

OUR favourite punch-bag, Uncle Clive, has certainly taken a quantum leap with the latest advertising for the QL – backwards.

Not only does his double-page copy in the Sunday papers make some dodgy price comparisons (are you listening ASA?), but he's obviously run out of complimentary reviews to quote from (or is it that there just weren't any?).

At one time the world's greatest gift to milk-float racing could rely on *PCW* and the other ageing heavyweights to say something nice about his latest micros, but now it's down to the level of *Soft* (a magazine which folded last spring, as Acorn Abusers will know) and *Personal Computing Today* (?).

New horizons

JUST to show how up-to-date we are, here's a quote from *The Times* Computer Horizons page of February 26 to brighten your day.

The story referred to Olivetti paying £10 million for almost a 50 per cent stake in Acorn – 'a company valued at more than £30 million when its shares were suspended nearly three years ago.'

OutDrageous!

READERS will be pleased to see a picture of reviewer Chris Drage on page 145. No, he's not the one laughing in the middle, but the bumble bee lookalike sucking his finger on the left.

Anyone with a similar jumper can buzz along with Chris at the Acorn User Exhibition in July.



Smokin' Joe Black

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